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REMOTE STORAGE

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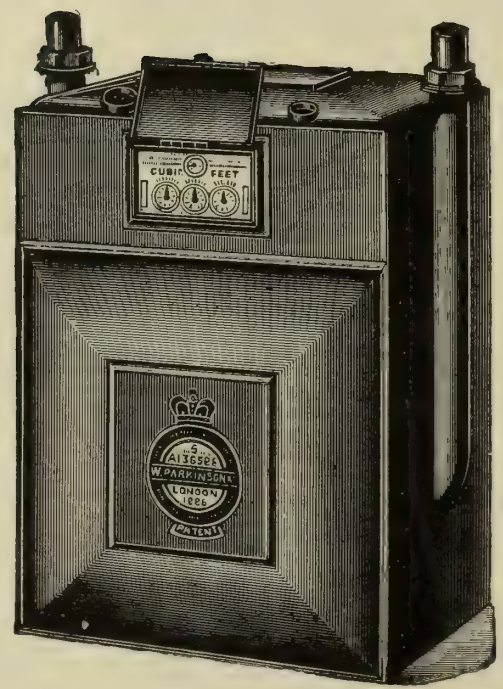
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EDITORIAL NOTES—GAS, &c.

New Acts Affecting Industry.

THE sittings of Parliament last year were remarkable for many things; among them the largeness of the legislative output affecting industry. The session was, so far as memory serves, without parallel in this regard; and it will behove all associated with industrial management in any way to make themselves fully acquainted with the provisions of certain of the new Acts. The measures referred to are the Workmen's Compensation Act, the Trades Disputes Act, the Notice of Accidents Act, the Census of Production Act, the Alkali Works Act, and the Prevention of Corruption Act. Those of the measures not yet published will shortly be procurable by those who desire possession.

We are not among those who begrudge the fullest possible attention that Parliament can bestow upon questions affecting the well-being and protection of the workers of industry and commerce, providing there is not, as the result, preferential treatment of one section of the body-politic over other and equally necessary and important sections. Labour has been granted a very big slice of the past parliamentary year; and it must be regretted by all who have the best interests of the country's workers at heart that the legislation in which they are concerned has been of a character in which the scales of justice have been inequitably held as between employer and employee. Those who think deeply, and those who are far-sighted, will consider and look beyond the provisions of the Compensation, Trades Disputes, and Notice of Accidents Acts for their effect; and they are certain to come to the conclusion that largely the effect will be controlled by the employer. As the compensation screw has been tightened, as the Trades Unions have been given preferential freedom, and as the obligations of the employer and his anxieties have been increased under the Notice of Accidents Act, it will be to his interest to reduce, as far as possible, his reliance upon manual labour. The Government, whipped up by the pseudo-friends of labour, have acted not in accordance with their own intelligence, but at the dictation of interested parties, without regard for the consequences. If it had been the wish of the Government to specially legislate for the acceleration of the adoption of labour-saving machinery, and for the displacement of elderly and unskilled workers, they could not have carried through measures better calculated to do this than the Compensation, Trades Disputes, and Notices of Accidents Acts of the past session.

The employer will naturally do his best to escape to the utmost from the leashes of these Acts. In his own protection, he will adopt machinery wherever possible, in preference to manual labour. Machinery requires maintenance, which is an approximately known quantity; compensation, with the door thrown wide open, and so many factors contributing to the necessary conditions for its production, is an unknown quantity—whether relating to magnitude, duration, or frequency. The employer will weed out to the fullest possible extent those who, through age, infirmity, incompetence, or carelessness, are likely to be the means of endangering him or causing him trouble in any way; and he will increase his care to confine his employees to those upon whom he feels that he can rely. The new Compensation Act narrows the protection that the employer had under the former Acts; and it is only natural that he should seek to lessen his responsibility by using every available means for reducing his dependence upon labour. The imposition of greater insurance liabilities on, or the necessity for the provision of funds in other ways by, employers—especially small ones—must result in attempts to compensate the liability by reducing wages, and in the supersession by non-society men of trade unionists who will not work for lower wages. The Trades Disputes Act gives additional reason to the employer for placing himself to the fullest extent beyond the tyranny of Trades Unionism, in view of the elimination by the Act of the possibility of recovery from the Unions of damages for injury sustained by their aggressive procedure.

The broadness of the Compensation Act appears to be little understood at the moment. It has brought practically all personal injury, however trivial, under the ægis of compensation; and the ægis of compensation has been enlarged so as to include all persons—save policemen, outworkers, and men of the Army or Navy—who have entered into, or work under, a contract of service or apprenticeship, whether by way of manual labour, clerical work, or otherwise, and whether the contract is expressed or implied, is oral or in writing. According to Mr. Herbert Gladstone, the Act of 1897 brought six million persons within its operation; the Act of 1900, an additional million; and the new Act will add six millions more. We will not enter into the question of malingering, and the many other matters raised in the course of the debates over this measure. The Act is only treated here in the light of the ill-effect that over-legislation of the kind must have on the interests of labour.

The Trades Disputes Act has been so much in evidence in the Daily Press that all engaged in industrial management must have a general knowledge as to what the Act has done in elevating to a privileged position Trades Unionism, and in giving complete immunity to the funds of the Unions. In the King's Speech on the prorogation of Parliament, the hope was expressed that the Trades Disputes Act had removed all legitimate cause of grievance. One may hope, but still feel that the hope is a vain one. If the Act had been intentionally constructed with the object of creating and embittering industrial trouble, the work of construction could not have been better done. The Act has been severely criticized by most eminent jurists, politicians, and employers of labour, as one from which equity has been entirely banished at the dictation of the trades unionists and socialistic demagogues who now sit in Parliament. Then there is the Notice of Accidents Act, which, as was pointed out in the "JOURNAL" on April 17 last (when the measure was still in its first stages), makes more stringent the obligation of employers in respect of accidents than under the Notice of Accidents Act of 1894; and the most paltry accidents will now have to be brought to official knowledge. The three Acts so far referred to must be read together, in considering what will be the ultimate effect of this stiffening of labour legislation as against employers. It can only, as already remarked, increase their inclination to sacrifice manual for mechanical aid wherever possible.

Regarding the other Acts mentioned in the opening paragraph, the Census of Production Act provides for the compilation of a census of production and statistics of the trade of the country. Next year has been the one prescribed for the first census; and subsequent ones will be at the discretion of the Board of Trade. The Alkali Works Act, which was principally directed to the greater regulation of the emission of noxious gases or other waste from alkali works, received the Royal Assent prior to the August adjournment of Parliament, and was fully noticed in the "JOURNAL" for Aug. 28 last. The Prevention of Corruption Act comes into operation from to-day. It has been dealt with so recently in our columns that there is nothing more to be said about it, excepting to express the hope that its intention of producing greater purity in commercial transactions will be fulfilled. If the good wishes of honest men will produce success, then the success of this Act is fully assured.

Features of Gas Bills—Testing and Discounts.

The recent publication of the notices of the Gas Bills to be promoted next session will have informed readers as to the smallness of their number. But though their number is not large—under twenty, in fact, including local authority "Omnibus" Bills with a few ordinary gas clauses in them—their examination for feature and novelty cannot be any the less critical. The group that is dealt with elsewhere to-day comprises Companies who have been working under Provisional Orders, and are now going to Parliament direct for the first time, and new Companies proposing to open up fresh ground and enterprise. Looking at these Bills, and glancing cursorily through those yet to be investigated more closely, there appears to be little about them, if we except the Kingston-upon-Hull Bill, that will give rise to anything of a sensational nature. We say "appears to be;" as, forsooth, in these days it does not do to speak beforehand of parliamentary matters too assertively. The intervention of local authorities has sometimes the effect of creating all sorts of unhappy issues and positions.

In this first group of Bills, however, we do not see anything on the surface that should foment discussion in the Committee-Rooms, unless it be in the matter of the amount of capital sought, and the standard prices asked for; and differences in these respects can, as a rule, be promptly settled without asking for a decision from a Select Committee. Regarding the amounts of capital entered in the Bills, in most instances they are of modest amount. The largest augmentation is sought by the Grays and Tilbury Company; out of a total of £200,000, asked for in the Bill, £136,000 being additional, besides the customary one-third borrowing powers. Altogether the total capital required by these Companies, including that already spent and the borrowing powers requested, is close upon £500,000. The standard prices are all very close—gravitating between 4s. 3d. and 5s. The Annfield Plain Company is the lowest with 4s. 3d. Four Companies ask for 5s.; and two of them are the Bude and Brockenhurst Companies, whose Bills in detail are as much alike as two peas. Among special interesting points, the Boston Spa Company are seeking authority to supply certain districts left derelict by another Company having power of supply over them; and in the case of the Selsey Company, they are proposing to lop their district off that of the Petersfield Gas Company. The Boston Spa Company also submit the reasonableness of creating and distributing among the present shareholders £2000 that has been spent out of profits on the works.

There is strict compliance, in all the eight Bills in this group, with the model clauses in specifying an illuminating power of 14 candles; but promoters should not overlook the fact that certain Companies last session were authorized to supply 13-candle gas. Concerning the methods of testing the gas, it is difficult to see why the model clause has not been adhered to in all cases, in view of the advantage that it offers to gas undertakings by treating the gas in a manner to obtain from it the best possible result when burned at the fixed 5 cubic feet rate. The Annfield and the Llandrindod Wells Gas Bills prescribe the "Metropolitan" argand burner No. 2, a bar photometer, and the Harcourt 10-candle pentane lamp. The Shanklin Company do the same; but they propose to secure the option of using either the bar or the table photometer. We do not think they will trouble themselves over the latter. The Grays Company specify the table photometer, and not the bar. The Boston Spa Company merely define the Metropolitan No. 2 burner, and say nothing about the standard of light or the photometer. But there are three Bills, under the charge of one firm of Parliamentary Agents—the Brockenhurst, the Bude, and the Selsey—the draftsman or draftsmen of which have apparently not heard of the new testing arrangements, and the model clause specifying them, for in all three Bills, for 14-candle gas, Sugg's "London" argand No. 1 is specified!

Touching upon this particular question of testing, it is rather astonishing that a precedent created last session by the South Suburban Gas Company's Act—that is to say, a precedent for Companies outside the Metropolitan area—has not been seized upon by promoters to a larger extent. It is feared that, notwithstanding the prominence that was given to the matter and its importance, it has been overlooked. There are two new Companies, however, who are proposing to take advantage of the provision; and these are the Annfield Plain and Llandrindod Wells Companies. The clause is worded the same in both Companies' Bills; and it may be quoted in order to emphasize it:—

> If the illuminating power of gas supplied by the Company shall be below the prescribed number of candles to an extent not exceeding half-a-candle, the Company shall not be liable to any penalty in respect of such deficiency; and if such illuminating power shall be below such prescribed number of candles to an extent exceeding half-a-candle, but not exceeding one candle, the penalty to which the Company shall be liable in respect of such deficiency shall be not exceeding £5.

We are anticipating that it will be found that the same hand has caused the insertion of this clause in both Bills, and that that same hand has connection with the directorate of the South Suburban Company.

A most interesting feature about these Bills has reference to the question of discounts. In several of the Bills, advantage has been taken of the intimation made in the Model Bill, that the discount-limiting clause is not required if section 13 of the Gas-Works Clauses Act, 1847, is amended by appending these words: "Provided also that every such "contract entered into by the company shall be alike in "terms and amount under like circumstances to all consu-"mers." This amplification of the section in question is made, in certain of the Bills, in the clause incorporating by reference the Gas-Works Clauses Acts; and, excepting in a couple of these instances, no clause appears defining maximum discounts. We cannot conceive why in these cases, under the circumstances, the superfluous discounts clause appears. There is the Shanklin Bill, for example. In the forepart the way provided by the authorities for immunity from the restricting rebate condition for large consumption is properly applied; but later in the Bill stands the old clause defining a maximum of 10 per cent. for prompt payment and 15 per cent. for large consumption. Why? Then in the Grays and Tilbury Bill, there is a clause that seems to require some explanation or alteration. The amendment of section 13 of the Gas-Works Clauses Act, 1847, is duly made; then later on prompt payment is limited to 10 per cent. There is nothing to complain of about that, as 10 per cent. for prompt payment is not the objectionable feature of the discounts clause. But there appears this subsidiary passage of somewhat cryptic meaning: "Pro-"vided also that, in the event of a discount given under "the provisions of this section being made of an equal "amount applicable alike, without regard to the circum-"stances of the consumption, to all consumers of gas by "means of ordinary meters, the standard price, for the pur-"poses of this Act, shall be *the price charged to such consumers, "less the said discount.*" Now, what is the literal interpretation of this? The standard price in the Bill is 5s. But this provision, if it means anything at all, means that whatever the charge to the consumers, that charge, less the uniform discount to all consumers, shall be the standard price. This would hardly meet the views of the shareholders. We rather fancy that what is intended is that, if a uniform discount is allowed, then that discount shall be regarded as a reduction for the purposes of the sliding-scale. We may be wrong; but, to say the least, the latter part of the passage in question does not appeal to us as a pattern for lucidity.

Those Limited Companies who are among the promoters in the group of Bills under notice will be interested in an announcement that we make elsewhere, that definite steps have now been taken to test the claim of the Inland Revenue Commissioners for stamp duty, on the vesting of the property of the Limited Company in the statutory one. It is a matter that we strongly commend to the consideration of such promoters; for it would be well, now that a movement has been made, to get the uncertainty that at present exists cleared up once and for all.

Electricity Consumers and Supply Failures.

It is not our intention to gloat over the misfortunes of the electrical competitors of the gas industry; but however benevolent one may feel, the many contingencies besetting constancy of electricity supply cannot be bye-passed in the rivalry for business. At the same time, we are not disposed to agree with those who hold that "all is fair in love and "war;" but it may be submitted that all is fair in business rivalry that is consonant with fact. Therefore, we shall not be charged with taking any mean advantage in again referring to two recent important failures of electricity supply in London. Nor need it be feared that we shall be charged

with discourtesy in mentioning the fact that those of our electrical contemporaries perused by us last week gave a modicum of space to their references to the extinction of the electric light in Oxford Street one evening while Christmas shopping was at its full height, and as little as possible was said about the disaster in the South Metropolitan Electric Light and Power Company's district. These two accidents could not have occurred at a worse time, both for the suppliers of electricity and particularly for the consumers. It is during the long-hour lighting days that the tradesmen very properly hope to reap the best harvest of the year; and therefore that is the period during which they can least of all afford to be deprived of light. In the one case, the light failed in the large shops of Oxford Street just at the time when they were packed with customers; in the other, owing to the bursting of a boiler, supply was suddenly cut off throughout large and thickly-populated south-eastern districts. Through the busiest part of the Christmas shopping, the tradesmen in the latter areas who had gone over to electricity, and during the festive season those householders who had had the gas-fittings removed from their rooms, were put to their wits' end to get sufficient light by which on the one hand to do business and on the other to entertain their friends and enjoy themselves. However melancholy the accident, however deep the sympathy of consumers, and however greatly they may strive to feel at peace with the whole world and show goodwill to all men, it is hard for them, at such a time and under such conditions, to philosophically resign themselves to the inconvenience and the discomfort of being without their usual means of artificial illumination, and to feel graciously indulgent.

From the business point of view, the southern accident was—we agree with an electrical contemporary—a serious matter for the South Metropolitan Electric Supply Company. Not only did they lose business at an important time, but confidence has been lost and business has taken a short cut to a more dependable quarter. Consumers cannot be expected to retain confidence when they learn from the Chairman of the Marylebone Electricity Committee that even a "flash-over" on one of the big machines—a trouble to which, he admits, "electric plants are very liable"—will cause failure, as it did cause it in Oxford Street, of the electric supply. It is foolish of the electrical press to attempt to minimize the length of time that the consumers in the South Metropolitan Electric Supply Company's district (excepting in that portion served from the small Sydenham station) have been without a supply. It was fortunate that the Company had purchased those works at Sydenham; as the maintenance of the supply in this residential corner of their district from that small station put a better appearance on the breakdown in the eyes of the outer world than people within the other parts of the extensive area know only too well the conditions warranted. The fact is that the whole of the electricity consumers who are not in the old district of the defunct Crystal Palace Supply Company, suffered more or less through the catastrophe; and all would have been deprived of supply if the Sydenham station had not been purchased. However, "it's an ill-wind that blows nobody good." Directly consumers, especially shopkeepers, in the huge district found that it was not one of those temporary failures to which patient electricity consumers become familiar, and are not unacquainted with in the Company's area of supply, the South Metropolitan Gas Company's fitters were anxiously requisitioned to bring relief, and, in many a shop and in many a house before Christmas, the reliable gaslight was restored, to the delight of those stranded electricity consumers who were fortunate enough to be among those who first sought succour of the Gas Company (whose chemical works, by the way, received damage from the explosion). This disaster has come perhaps somewhat opportunely for London. It raises once again the question as to the policy of putting all one's eggs in one basket. Although centralization in the generation of electricity may assist in whittling down costs, cheapness is not the only consideration when so much beyond the generating-station depends on the constancy of supply.

A Vigilant Ratepayers' Association.

If ever the ratepayers of Newport (Mon.) become overburdened by the "progressiveness" of the Corporation, it will not be because they are kept in ignorance of the financial position of the several undertakings which are in the hands of that body. Their information will not, however, come from an examination of the municipal accounts, because, as presented, they will probably not be understandable by the ordinary ratepayer, but from the light thrown upon them by the vigilant Ratepayers' Association which is in existence in the borough, the Committee of which includes the Secretary of the Gas Company (Mr. T. H. Hazell) and representatives of the Chamber of Commerce and the principal trade organizations. The latest instance of the Association's watchfulness over the interests of the ratepayers is to be found in a circular the Committee have issued dealing with the accounts of the electricity works and the tramways for the year ending March 31, 1906, which have lately been published; thus completing their review of all the municipal accounts for the last financial year. The value of the criticism contained in the circular is shown by the fact that at a recent by-election a statement was made that the two undertakings dealt with "had not cost the town a single penny," and the speaker did not think they ever would. No doubt those who listened to the speech containing these remarks went away perfectly satisfied that they were justified. But the Committee's circular shows clearly that they are absolutely inaccurate; for in the four years 1897 to 1902, the direct contributions to the undertakings out of the rates amounted to £3863. These transfers were made without any concealment. But other amounts were directly contributed in a very different way, as the Committee point out. Then there have been indirect contributions—such as the use, without charge, of the various staffs for the purpose of the undertakings. The market accounts furnish an example of this in connection with the lighting; and the Committee cannot help coming to the conclusion that in every case where the electric light has superseded gas for municipal purposes, there is *primâ facie* ground for assuming that an indirect contribution is being made out of the rates towards the Corporation undertakings. We cannot go into the details covered by the Committee's circular. Suffice it to say that, after three years' working, not a penny has been set aside to meet renewals, and the two undertakings are £2998 to the bad. Consequently, these particular examples of Corporation enterprise do not merit the eulogy which is continually heard in regard to them, a specimen of which was quoted in the early part of these remarks; and, judging from the statements in the circular, those who indulge in it are diverting the attention of the ratepayers from the real position. This, however, is occasionally made apparent in a way that is possibly not intended. It appears that there is under consideration the question of supplying electricity to the docks; and it has been stated that, if the matter went through, "it would be the salvation of the borough electricity concern." Although, according to one speaker, the undertaking has "not cost the town a single penny," and is not likely to do so, another considers its condition to be so serious as to need salvation. The latter view seems to us to more correctly represent the facts as disclosed by the circular under notice.

The Gas Supply of Paris.

It will doubtless be remembered that the Municipal Council of Paris, at their meeting on the 3rd ult., decided, by a majority of only one, to have the gas supply of the city carried on under a concession, and to terminate the temporary joint arrangement between the Municipality and the Liquidators of the Paris Gas Company at the close of the year. In virtue of this decision, offers were invited, to be sent in by the 15th ult.; and a representative Committee, with the Prefect of the Seine as President, was appointed to examine the proposals submitted. It appears that about twenty have been received; four or five of them emanating from parties who are evidently serious in their desire to obtain the concession on the terms laid down by the Prefect, with certain more or less important amendments. Since these were prepared, it has been decided to allow 4 per cent. instead of 3 per cent. as the minimum return on the capital invested. Interviews have taken place between representatives of concessionary undertakings and the Streets Committee of the Council, as there was little time to lose, in view of the vote to break off with the Gas Company at the end of the month just closed. But a few days ago there seemed to be a probability of the existing provisional joint arrangement being continued for another year.

The Midland Junior Gas Engineering Association will meet at the City of Birmingham Technical School, Suffolk Street, next Saturday, when Mr. R. J. Rogers will read a paper entitled "Notes on Distribution and Gas Supply."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 49.)

THE Stock Exchange has just completed a disjointed and not an altogether happy week. The holidays cut out the middle, and perhaps the most important, part of it. On the opening day, things were in a state of high tension over a heavy American account which had to be settled in spite of stiff rates of contango. On the re-opening on Thursday, that market was still much agitated, but eventually it was believed that more or less satisfactory arrangements had been effected. In other lines the tone was far more favourable; and the anticipation of monetary conditions being better, produced a good feeling. In the Money Market, there was a very strong demand on account of the Stock Exchange and the close of the year; and rates for short loans hardened accordingly. But for discount, especially for long dates, rates were easier. Business in the Gas Market was naturally quiet; and it was almost wholly devoid of feature. There was hardly any variation in prices; and the very few changes in quotation that were made were almost infinitesimal. In Gaslight and Coke issues, the ordinary was a little dealt in at good, steady figures, the range of prices being from 98¾ to 99½. In the secured issues, there was no business done, except one deal in the preference at 108¾. South Metropolitan, though little noticed, did not suffer from the lack of support—transactions being marked at 129, and 129½. Nothing at all was done in Commercials. In the Suburban and Provincial group, Alliance old was done at 20⅞, Brighton original at 233½, ditto ordinary at 165, British at 42¾, and West Ham at 102½. In the Continental Companies, Imperial changed hands at from 178½ to 177, the last mark being the lowest, and ditto debenture at 96¼. European fully-paid was done at 24⅞, and Union was not dealt in. Among the undertakings of the remoter world, Melbourne 4½ per cent. was done at 102, Primitiva at 7½, and River Plate debenture at 98.

The closing prices are shown in our Stock and Share List on page 49.

According to usual custom, we append a table showing the closing prices at the end of 1905 and those of 1906, with the respective gains and losses in value. The general firmness of gas securities as an investment market is well illustrated by the inconsiderable magnitude of these variations. The fact that the greater number are in the downward direction requires no explanation, when almost everyone is acutely aware of the depression existing in even the most gilt-edged markets, and of the unprecedented state of disorganization that is oppressing our Money Market. At this time last year, we said that the gas industry appeared to be in a decidedly healthy state; and we say the same again now.

GAS COMPANIES.	Prices on Dec. 30, 1905.	Prices on Dec. 30, 1906.	Gain or Loss.
Alliance and Dublin, 10 per cent.	20—21	20—21	—
Do. 7 per cent.	14½—15½	14—15	−½
Bombay, Limited	6¼—7¼	6⅞—7	−¼
Do. New, £4 paid	5—5⅛	5—5⅛	—
Bournemouth, 10 per cent.	29—30	28—29	−1
Do. B. 7 per cent.	17—18	17—17½	−½
Do. Preference 6 per cent.	15½—16½	15 -16	−½
Brentford, Consolidated	260—265	260—265	—
Do. New	197—202	200—205	+3
Do. 5 per cent. Preference	125—130	120—125	−5
Do. 4 per cent. Debenture Stock	101—104	101—104	—
Brighton and Hove, Original	222—227	230—235	+8
Do. A Ordinary Stock.	162—167	163—168	+1
British	42½—43½	41—43	−1
Bromley, Ordinary 5 per cent. A.	121—124	121—125	+½
Do. 3½ per cent. B.	91—94	91—94	—
Buenos Ayres (New), Limited	12¼—12¾	11¼—12	−¾
Do. 4 per cent. Debenture	95—97	94—96	−1
Cagliari, Limited	24—26	24—26	—
Cape Town and District, Limited	17—17½	14—15	−2¾
Do. 4½ per cent. Preference	10—10½	9½—10	−½
Do. 6 per cent. 1st Mort.	52—54	50—52	−2
Do. 4½ per cent. Deb. Stock	100—102	96—98	−4
Chester 5 per cent. Ordinary	..	108½—110½	—
Commercial, 4 per cent. Stock	116—118	110—113	−5½
Do. 3½ per cent. do.	112—114	107—110	−4½
Do. 3 per cent. Debenture Stock.	84—86	83—85	−1
Continental Union, Limited	126—129	124—127	−2
Do. 7 per cent. Preference.	143—148	138—143	−5
Derby, Consolidated Stock	125—127	122—124	−3
,, Debenture Stock	108—110	105—107	−3
European, Limited	22—23	24½—25½	+2½
Do. £7 10s. paid	15—16	18—19	+3
Gaslight and Coke, 4 per cent. Ordinary	102—103	98⅝—99½	−3½
Do. 3½ per cent. maximum	89—91	88—90	−1
Do. 4 per cent. Con. Pref.	110—112	107—110	−2½
Do. 3 per cent. Con. Deb.	86—88	84—86	−2
Hastings and St. Leonards, 3½ per cent.	101—103	98—103	−1½
Do. 5 per cent.	..	118—121	—
Hong Kong and China, Limited	19½—20½	19½—20½	—
Imperial Continental	233—235	177—180	S'tk Con.
Do. 3½ per cent. Deb. Red.	96—98	95—97	−1
Lea Bridge Ordinary, 5 per cent.	118—123	120—125	+2
Liverpool United A	237—239	229—231	−8
Do. B	172—174	167½—168½	−5
Do. Deb. Stock	109—111	110—112	+1
Maidstone, 5 per cent.	..	145—150	—
Malta and Mediterranean, Limited	4¼—4¾	4¼—4⅝	—
Metropolitan of Melbourne, 5 p. c. Deb.	100—102	101—103	+1
Do. Do. 4½ p. c. Deb.	100—102	101—103	+1
Monte Video, Limited	11½—12½	11½—12½	—
Newcastle and Gateshead, Consolidated	107—109	111½—112½	+4
Do. 3½ p. c. Deb. Stk.	98—100	98—99	−½
North Middlesex, 10 per cent.	18½—19½	20 21	+1½
Do. 7 per cent.	13—14	13½—14½	+½
Oriental, Limited	148—151	150—155	+3
Ottoman, Limited	6—6⅛	5¾—6⅛	−¼
Primitiva, Ordinary	7—7½	7¼—7⅝	+⅛
Do. 5 per cent. Preference.	5⅛—5⅜	5¼—5⅜	+⅛
Do. 4 per cent. Deb. Stock	97—99	94—96	−3
River Plate, Ordinary	12¾—13¼	12¼—12¾	−½
Do. 4 per cent. Deb. Stock.	95—97	95—97	—
San Paulo, Limited	13—13⅛	13⅛—13¼	+¼
Do. 5 per cent. Deb. Stock.	51—53	49—51	−2
Sheffield, A.	244—246	246—248	+2
Do. B.	244—246	246—248	+2
Do. C.	244—246	246—248	+2
South African	15⅝—16⅛	15⅝—16½	—
South Metropolitan, 4 per cent., Ordinary	132—134	128—130	−4
Do. 3 per cent., Deb. Stk.	87—89	85—87	−2
South Shields Consolidated Stock	..	156—158	—
South Suburban, Ordinary 5 per cent. Stk.	123—126	123—126	—
Do. 5 per cent. Preference Stk.	125—130	123—126	−3
Do. 5 per cent. Debenture Stk.	132—137	128—133	−4
Southampton, Ordinary	109—112	105—110	−3
Tottenham and Edmonton, A 5 per cent.	125—128	127—130	+2
Do. B 3½ per cent.	99—102	104—106	+4½
Do. 4 p.c. Deb. Stk.	105—107	101—103	−4
Tuscan, Limited	9½—10	10½—11	+1
Do. 5 per cent. Deb. Red.	100—102	101—106	+4
Tynemouth, 5 per cent. maximum	..	106—108	—
Wandsworth and Putney, B 3½ per cent.	137—140	140—145	+4
Do. C 3½ per cent.	113—116	113—116	—
Do. 3 p.c. Deb. Stk.	80—83	79—82	−1
West Ham, 5 per cent. Ordinary.	106—108	102—104	−4
Do. 5 per cent. Preference	123—126	120—123	−3
Do. 4 per cent. Debenture Stock	102—107	101—104	−2

PERSONAL.

Mr. B. A. LEWIS, of Carmarthen, was on the 18th ult. installed W.M. of St. Peter's Freemasons' Lodge, No. 476.

Mr. E. H. SCOTT, Assistant-Chemist to the Priestman Collieries, Limited, Blaydon-on-Tyne, has, from a number of candidates, been successful in obtaining the position of Chemist to the Manvers Main Collieries, Limited, Wath-upon-Dearne.

OBITUARY.

Mr. JOHN W. BLACK, Gas Manager at Para, Brazil, recently succumbed to an attack of fever; Mrs. Black having died a few days previously. For several years before 1902, Mr. Black was Gas Manager at Stewarton, in Ayrshire. He was a native of Leith.

There has recently passed away at Fallbrook, San Diego County, California, at the advanced age of 80, Mr. THOMAS SMITH, a gentleman whose name will always be associated with the gas supply of Hereford. He was born at Tooting in 1826, and went to Hereford in 1855. He had not been long resident there before he brought himself into public notice by his letters to the local newspaper on various subjects; among them being the price and quality of the gas. These letters led to the holding of a public meeting at which the well-known Mr. George Flintoff delivered a lecture. This induced the Town Council to enter into negotiations with the Gas Company for the sale of their works, which could at that time have been purchased for some £16,000 or £18,000. The Engineer appointed by the Company (the late Mr. Thomas Greaves Barlow) declined to meet Mr. Flintoff, who was engaged by the Council to act for them; and those who took the lead in the negotiations let the matter drop. It was taken up again later, and the works eventually acquired in 1872.

We regret to record the death, on the 21st ult., in his 60th year, of Mr. JAMES HENRY PARSONS, the Manager of the Oswestry Gas-Works. He had not been in good health for some time; but it was not until a week before his death that he found it necessary to keep his room; and he succumbed to an internal complaint. His connection with the Oswestry Gas Company began in 1876, when it was not in anything like its present prosperous condition. He, however, immediately commenced a series of improvements in the works, which in the course of time completely transformed them. As a designer of gas-works he enjoyed a well-deserved reputation; those at Barmouth and Buckley having been built from his plans and under his supervision. He was also Consulting Engineer for a number of gas undertakings in various parts of the country. For about three years he was Secretary of the Company in whose service he died. He was a prominent Freemason, and several times held office in Provincial Grand Lodge. He is survived by his wife, four sons, and four daughters. The funeral took place on Monday of last week, at the Oswestry General Cemetery. The death of Mr. Parsons is the second loss the Company have sustained; the Chairman, Mr. F. B. OWEN, having lately passed away.

Wit.—In the "Pall Mall Gazette" last Saturday, this little piece of humorous writing was found: "How few of our readers will remember, and how many more will be surprised to be told, that it is only a quarter-of-a-century ago to-day since a London theatre was first lighted by electricity—the Savoy? Things move so rapidly that we are beginning to forget gas lighting as a survival from the dark ages, though gas is still useful in heating and cooking."

ELECTRIC LIGHTING MEMORANDA.

A Review of the Past Year.

SCRUTINIZING affairs of the electrical industry from the standpoint of representatives of a competing industry, and having regard only to those matters where the two come into conflict, it must be said that the past year has been full of interest, with moderately exciting events interspersed here and there. When we sum up the current relative positions of the two industries so far as they affect and bring influence to bear one upon the other, those engaged in the gas industry have no cause for discomposure, but every ground for satisfaction. The electrical industry has by no means stood still; but the greatest successes have been in connection with traction, with which we have no particular concern. In other respects, things have not gone so well with the industry as those engaged in it could wish. In electric lamp manufacture, there has been progress; but a large amount of indefiniteness and imperfection exists. Cooking and heating by electricity are not making any considerable headway; and electric prepayment meters do not appear to be gaining confidence and patronage. In industrial power supply, there are certain purposes for which electricity is particularly convenient, though somewhat costly, and yet not, as prices go, altogether remunerative for the purveyor of electricity; but those special purposes do not, to the regret of electricians, comprehend the whole. Accounts published during the year have shown that profits have, in many cases, diminished through reduced prices accompanied by higher working expenses; and for municipal undertakings loans are not easily obtained at moderate rates of interest. Copper, too, has gone up by leaps and bounds; and expenditure for new work and extensions has been on the up-grade. Electric plant manufacturing concerns are, so far as profit producing goes, still under a cloud. So altogether the position for the electricity industry is not one to cause any great amount of exhilaration. Sham optimism has been largely on the surface of affairs electrical during the year; and the vials of wrath and abuse have been running over—and copiously. The stock statements as to the poisonous character of legitimately used gas, which has never been known to poison anyone throughout upwards of a century, when so used, have been poured out in volumes at intervals in the hope of deluding the credulous. But the behaviour of the men who engage in this is not exactly heroic. They attack by word, but refuse to subtantiate by deed. Take two examples from many. There was the prize essay published by the Electrical Contractors' Association. The criticism of that essay was received without a note of response. At Ipswich, some most extravagant statements were published by the Corporation Electricity Department as to the relative cost of gas and electricity; but a challenge by Mr. L'ce Fletcher, on behalf of the Welsbach Company, to support statement by demonstration, was received with cold silence. There has been less heard about relative costs in the course of the year. The electricians have ascertained how hard it is to kick against the pricks. It is found by consumers, when their accounts are delivered, that their custom has been obtained under false pretences as to cost; and there is no argument in the world that is so forcible as that of the pocket.

The strenuous exertions that have been made during the year by electrical undertakings to secure business have been convincing of the recognition by them of the fact that they must be up and doing. Development is a slow process without particularly propitious circumstances, or the fullest application of careful encouragement. Literature, in the shape of "Electrical Bulletins" and circulars, has been freely distributed; and mendacious posters have claimed public attention. Canvassing and exhibitions have been resorted to; builders have been tempted to have houses wired; and wiring and fitting systems have been further tried. There is not the slightest distress in the gas industry over all the commercial activity the electrical industry can bring to bear, nor over statements of real fact; but there must be protest when there is the gross perversion that has been too plainly in evidence in recent times. Among the methods that were proposed to induce new custom was that of the Dublin Corporation, of giving new consumers a six months' run at half price; but we did not hear whether this, what appeared to be a piece of illegality, was proceeded with, and, if so, what was its effect. Several new systems of charging were added to the already long list of complicated methods to which the electrical industry has given birth in the endeavour to gain new custom. The old order of a flat-price, with discounts according to consumption, is not good enough for the managers of the electrical industry; but consumers in many places have been clamouring for its restoration. The system on which their fathers bought, and on which all other industries sell, is good enough for them. The maximum demand system has fallen into further disrepute—notably, among other places, at Brighton. There has been a great discussion during the year as to the charges for power and for cooking and heating. Many undertakings have rashly dropped to 1d. per unit as a maximum for these purposes. And in connection with the 1d. and fractions of 1d. for power purposes, there has been a great babbling about prices being calculated upon the provision the undertakers have to make for the purpose of meeting the maximum demand of the consumer. Rather a hazy kind of thing upon which to make a definite calculation as to a paying price for a consumer whose success or otherwise (which depends upon many factors) in business will control his consumption! If this system of calculation is applied to the power user, and it works out honestly to the other consumers, why is it not applied to cooking and heating and lighting? If 1d. is fair for a power user, it must be too low for current used for such a comparatively small and intermittent purpose as cooking. And if 1d. is right for cooking, a price much lower than that ought to be charged the public for street lighting. The more the matter is argued, the more absurd the wide differential prices of the electrical industry are shown to be, and the more clear is the injustice of the bottom-prices to the users for lighting purposes. Consumers are beginning to argue these things among themselves, and are getting dissatisfied. About the 1d. per unit for power purposes, the Liverpool Electrical Engineer has said that it has failed in that industrial city to attract long-hour users; and that it is unremunerative for short-hour ones. Messrs. Bowden and Tait, in the "Electrical Review," Mr. George Wilkinson, and Mr. W. B. Esson have, in the course of the year, also pricked the bubble of a 1d. being a profitable maximum rate for power. Then connected with charges are meters. Their erratic character in respect of veracious registration has been disclosed during the year by a report of the Highways Committee of the London County Council and by correspondence in one of our electrical contemporaries. There was, a few weeks since, an amusing case in the City of London Court, for the recovery of money, in which case it was shown that an electricity meter had been diligently prosecuting its business when no current was passing through it. Prepayment meters, on account of cost, complication, unreliability, and a disinclination on the part of the working class to have anything to do with them, have not made headway.

In the lighting field, flame arc lamps and the new metallic filament lamps have almost monopolized attention. It seems to be admitted that the ordinary arc lamp and the carbon filament lamp have reached the zenith of possible improvement, and that they cannot be relied upon to do anything important now in advancing the interests of the electrical industry, with incandescent gas lighting standing in the way. What the electrical industry has now to secure are lamps of greater efficiency in relation to consumption, less costly in running, less expensive initially, more reliable, less unsteady, and not subject to such great depreciation as are electric lamps of the present. In the flame arc lamps, or in the new metallic filament lamps, it cannot yet be said that anything, excepting enhanced efficiency in relation to the consumption, has been accomplished. With regard to the metallic filament lamps, they have such great likes and dislikes in reference to the conditions of their use, that hopefulness is not all at a high level in the electrical world as to their future success. The tantalum lamps decline to do efficient service with alternating current; the Nernst lamp is discontented with voltages below 200; and most of the other lamps require such low voltages that they must be used in series, or "brief life is here their portion." This necessity for use in series will, from the consumers' point of view, wipe out all the promised money advantage of lower consumptions and higher efficiencies. By some electricians this is looked upon as beneficial rather than otherwise; for the bare idea of assisting consumers to economize consumption, when they are now on their own account economizing all too seriously, has been rather disconcerting to some engineers. We do not agree with them, but have not time to argue the matter again at present. However, the attempt to perfect these metallic filament lamps is proceeding with great activity; and something good may be produced later on. Meanwhile, consumers continue to be implored to spend money on renewing their carbon filament lamps more frequently, in order to save money on consumption. Consumers are supine, grumbles the electrical engineer; and Mr. Fedden, of Sheffield, and the Ediswan Company have been telling the electrical engineer to convey to consumers the intelligence that carbon filament lamps should be renewed two or three times a year—in other words, they should spend 2s. to 3s. per point per annum on renewals. Consumers with a large number of points of lighting wonder whether the expenditure is really compensated for by the extra candle power obtained. Manufacturers of these lamps have also been severely "slated" for not producing lamps of more uniform character and of greater lasting power. They, in turn, have advised station engineers to look after their voltages, the variability of which is the cause of much annoyance through the depreciation of illuminating powers. Mr. Leon Gaster and Mr. G. Wilkinson are among those who have been addressing electricians on this subject of variable voltages during the year. There was a case in which Messrs. Mappin and Webb were lately concerned, in which the firm complained that they had to use candles in their West-end house owing to the departure of the Marylebone Borough Council from their contract voltage.

Street lighting has been a prolific subject of controversy, from which gas, as an economical public agent, has come out best. The City authorities have shown that the estimated savings in the lighting of the streets whence electricity has been evicted have been exceeded. In several places gas has scored further prominent successes. Among those specially noted during the year were Wellingborough, Coatbridge, Paliament Street and Whitehall, Vauxhall Bridge, and the new Victoria Railway Station. These are only examples of many. At Hastings controversy ran high, owing to the heavy expense that electric lighting has entailed through Corporation management (or mismanagement) of the electric undertaking. In this instance, the Corporation brought

upon themselves the ridicule of the ratepayers of the town, and of many other people who are not Hastings ratepayers. But Hastings is only an example of a great many other places where electric street lighting is favoured merely for the purpose of giving business to the Corporation electricity department. The Local Government Board have at Newcastle, Bridlington, and several other towns, through Mr. H. R. Hooper and Mr. R. H. Bucknill, given expression to their conviction that electric street lighting is much heavier in cost than an efficient system of incandescent gas lighting. There is substantial ground of complaint as to the preferential treatment that local authorities accord to their own electricity supply, instead of dealing with it as an independent branch of civic administration, and causing it to compete with gas on its merits. There was the Oxford Street scandal for example, in which the Lighting Committee, for stated and positive reasons, recommended incandescent gas lighting; and then, on opposition being raised by the electrical advocates, they veered round to electricity. Their original strong report favourable to incandescent gas lighting is on record. Further amusement has been caused by the continued efforts of electricians to turn the scale in favour of electricity by rubbing into town councillors the cost per candle power per annum, instead of tackling the more practical basis of the cost per mile of street lighting per annum. Figures as to the costs per mile are to be found in the "JOURNAL" for Oct. 30 and Dec. 18. Professor Silvanus Thompson gave before the British Association some useful comparisons of the costs of artificial illuminants, and which comparisons were dealt with in our issue for Aug. 14 last. The year also produced evidence that flame arc lamps are not appreciated in America; and it also yielded plenty of testimony concerning the tyranny of municipal authorities in compelling support of electricity undertakings through the public lighting, while it has gone forth from the "Electrician" that the "great majority" of streets can be sufficiently illuminated by incandescent gas-lamps. Of course, we think that all streets can be.

Enough has been said in the opening paragraph about the insignificant progress of cooking and heating by electricity; but on the use of electricity for industrial purposes, there is a little to be said. The large power companies are not—save perhaps one or two specially favoured concerns—finding that their clouds have any particularly nice silver linings; and users of electricity motors are becoming painfully aware that with this form of energy they are dealing with an uncertain quantity. One in eight was the proportion of motors that broke down in 1905 in the case of those insured in the British Engine, Boiler, and Electrical Insurance Company. Stoppage of supply, resulting in very considerable loss to a firm at Loughborough, was the subject of an action during the year; and the cycle and motor establishments at Coventry have had their output restricted owing to the failure of the Electricity Department to give a constant supply of electricity. The Local Government Board have reduced the period for the repayment of loans for motors; so that their experience of them does not justify long loan-periods. It came out, too, in an inquiry at Brighton, that the Corporation had had to spend £250 on the maintenance of motors which only brought in £573.

Speaking of failures reminds of the numerous occasions we have had during the year to chronicle the failure of electric lighting—in private houses, in churches, in shops, and in the streets. Two prominent incidents were those of Oxford Street, and in a large area of the South Metropolitan Electric Supply Company, just when Christmas shopping was in full swing. Accidents and fires due to electricity have been many during the year. According to figures in a report issued by the London County Council, it was ascertained that the ratio of fires to consumers in the case of gas in London was 1 in 2000; while that of those caused by electricity was 1 in 1000. It was reported in the City that twelve fires were caused by electricity in 1904, and a smaller number in 1905—Dr. Waldo, the City Coroner, giving it as his opinion that more accidents of the kind happened than come to light. Heavy damage was caused to the Italian and Hungarian Decorative Art Section of the Milan Exhibition—the outbreak being due, said a telegram published in this country, to the fusing of an electric wire. In South London, damage to the estimated value of £30,000 was done to a drapery establishment owing to fire started by inflammable material coming in contact with an electric lamp. At Derby, a man was killed under peculiar conditions by a voltage of only 200. Fatal accidents at generating-stations were also recorded.

Interest in parliamentary matters during the session clung round the singular position created by the Government in connection with London schemes through the dominating municipal influence in its following. Everything was hung up to make a clear passage for the London County Council electricity scheme, which, after all, was not comprehensive enough for the broad-viewed legislators now in occupation of the House of Commons. The London County Council were given such encouragement that they have promoted an extraordinary Bill for the coming session, which, if Parliament does not pursue the same tactics as last year, will be opposed by privately promoted schemes of more rational character. The General Powers Bill of the London County Council was also passed with clauses giving powers to Borough Councils to supply wiring and fittings to houses; but there is a proviso that the wiring and fitting business is to be carried on in such a manner that the revenue shall recoup the outlay. If a similar provision had attached to the wiring and fitting business of the West Bromwich and Kettering electricity undertakings, there would not have been the deficits that were reported during the year. While on this subject, it is convenient to say that the Electrical Contractors' Association continued their assault on municipal trading in wiring and fittings. The Brighton Corporation, after investigation, came to the conclusion that there was nothing in the business worth troubling over. Sir Alexander Kennedy has advised the Woolwich Borough Council that money can be saved by abandoning their wiring department—a course that he has advised many other London and Provincial Councils to adopt. The question of electrolysis made no headway in Parliament, though Lord Newton suggested that the subject might well be inquired into by a Board of Trade Committee. The literature of the year dealing with the question indicated that the action of vagrant electric currents in many places is having a weakening effect on gas and water mains.

Municipal trading in electricity was vigorously assailed throughout the year. A series of articles in the "Standard" showed a scandalous waste in connection with public lighting, and studied deception in the manner of keeping the accounts of electricity undertakings, in diverting proper charges against undertakings to the general purposes funds, and in under-assessing concerns for rating purposes. What the "Standard" disclosed in connection with London applies to numerous concerns in the Provinces. Local Government Board inquiries revealed most disgraceful conditions of finance, and a defiance of the Board's authority. But the Board are determined to have straight accountancy; and a proper spending of loans on purposes for which they are specifically granted. Brighton and West Ham were notorious examples of financial mismanagement. Mr. John Burns early in his tenancy of office at the Local Government Board appointed a Committee to consider the general question of the keeping of municipal accounts. The Committee completed the taking of evidence last August; and an interim report is expected immediately after the holidays. However, it is the extravagance of the Progressive party that is at the bottom of deceitful accountancy; and at the last municipal elections, the ratepayers of London made nearly a clean sweep of the municipal extremists who have been the cause of the prodigality. In certain places, the sale of electricity undertakings to private companies was broached during the year; but in no case did the matter go beyond suggestion. Towards the close of the year, Sir Alexander Kennedy made a report upon the Woolwich Borough Council's electricity undertaking, in which he condemned, in the strongest possible terms, the wastefulness of the late Labour-Progressive Council. The undertaking, on which £250,000 has been spent, entails a heavy burden upon the rates. Sir Alexander advises the Council to consider the feasibility of taking a bulk supply from the South Metropolitan Company's electricity station before incurring further expenditure. Since then the Company's Greenwich station has not been in a position to supply even the ordinary consumers. Depreciation has had a prominent place in the electrical polemics of the year; and many municipalities have had lessons which have forced them to appreciate the wisdom of the policy of making provision in this way. Excellent reports on the subject have recently been made.

There is no occasion for further comment on these aspects of electricity supply as we find them at the end of another year. There are several clouds hanging over the industry; but, as competitors, we must not adopt a rest-and-be-thankful policy because, in comparison, our own outlook is so much brighter. The means of utilizing electricity for all purposes will be without any doubt further improved; and we must therefore do all possible betimes to maintain our lead.

Bench Lighting by Incandescent Burners.—In the abstract of the paper, on "The Lighting of Railway Premises," by Mr. Henry Fowler, of Derby, which appeared in the "JOURNAL" for the 18th ult., an example of bench lighting by an incandescent burner fitted with a special anti-vibrator was shown on p. 821. We are asked to mention that the appliance is one of those made by the Anti-Vibration Incandescent Lighting Company, Limited, and is covered by two patents. It is No. 760 in their list of burners, lamps, &c., suitable for factory lighting.

"Transactions" of the Societe Technique.—We have received the volume of proceedings of the Société Technique du Gaz en France for the past year. It contains the report of the thirty-third annual congress, held in Paris from the 19th to the 22nd of June, comprising the papers submitted and notes of the remarks to which they gave rise. Most of the papers, which are illustrated by diagrams, reproductions of photographs, and plates, have already been dealt with in the "JOURNAL." The introductory matter contains an illustrated description of the Versailles Gas-Works, which were visited by the members on the 21st of June; and in an appendix is described the electricity generating station of the Société d'Electricité de Paris, at St. Denis, which was inspected by them during the afternoon of the last day of the meeting. The other matter composing the volume consists of particulars with regard to the Society's prizes, lists of the companies contributing to the funds of the Society, the awards to employees, the rules, accounts, lists of officers and members, &c. M. Victor Delahaye reviews the legal business of the year 1904-5, and brings up to date his useful index to the cases contained in preceding volumes back to 1884. The book has been produced, as usual, under the supervision of M. Payet, the Secretary of the Society.

THE ILLUMINATION OF INTERIORS.

The Illuminating Engineering Society (of America), formed less than twelve months ago, is likely to justify its existence by the character of the work it is doing. The Society has already established branches in New York, Chicago, New England, Pittsburg, and Philadelphia, and is following the excellent plan of having the same papers read and discussed at the various sectional meetings. The nature of the work—the study of illumination—makes the Society catholic in its membership, including gas engineers, electricians, and architects alike. The formation of such a Society in England has already been suggested; but the proposal was not taken up, probably due to the fact that most gas engineers, at any rate, have already as many technical meetings on hand as they can well attend. Incidentally, it may be suggested that there are many assistants in gas and electric works up and down the country whose duties lie to a great extent in the photometer-room and the laboratory; and they might well devote some part of their time to illumination, as distinct from mere candle-power problems.

The two papers—and particularly that of Mr. Woodwell—which are abstracted in another column from the November report of the American Illuminating Engineering Society, will amply indicate in which directions good work can be done. District superintendents also might help in this way, if only in the occasional publication of particulars of any good lighting scheme achieved, with diagrams of the disposition of lamps, and curves of foot-candle illumination obtained on the floors or working planes. As was suggested by one speaker in the discussion on these papers, for some time gas engineers have been striving to get the very most in candle power out of every cubic foot of gas; and it is now for those engaged in illumination work to see that the greatest effective duty is obtained from the candle power thus obtained. That the Illuminating Engineering Society—the title is not euphonious—are on the right lines to this end, is shown by the nature of the papers recently dealt with. Of the two papers on "Indoor illumination," by Mr. E. C. White and Mr. J. E. Woodwell, that of the latter is more comprehensive in character, and consequently of more general interest. The object of the paper is to outline the methods commonly employed in practical problems relating to the lighting of interiors; and this is considerably helped by descriptions and particulars of several concrete examples of illumination, thus illustrating the principles involved.

It is singular that both authors have something to say against the use of the ordinary polar diagram. In the one case, curves of uniform illumination are advanced as being more easily understood and applied; and in the other, the utility of the Rousseau diagram is preferably emphasized. Notwithstanding all that these gentlemen say, one cannot but think that, had these been the accepted diagrams and the familiar polar diagram brought forward for the first time, it would have been welcomed as being at once simple, graphic, and useful. It may be that it is liable to "mislead those unable to appreciate the actual phenomena which it represents;" but then the diagram is not intended for such people. The suggested possibility of misapprehension attaches with no less force to the substituted diagrams, which, indeed, presuppose a knowledge of the ordinary and more familiar curves. As Dr. Bell rightly says in the discussion, the ordinary polar diagram with a slide-rule is adequate for most purposes, and should present no great difficulty to anyone. This, perhaps, is beside the general purpose of the two papers; and it is to be said that the newer forms of diagrams merit some attention.

Mr. Woodwell's description of the Roussean curve will be read with interest by those unaccustomed to it. It shows proportionately the areas which gain or lose by the use of reflectors, and also the extent to which a small quantity of light borrowed from the horizontal zone may increase the intensity of light in a downward direction. This gain may, as Mr. Woodwell's diagrams indicate, be considerable; and where strong illumination is required for special purposes, the nature of the reflector—and, indeed, of all extraneous reflecting surfaces—becomes of considerable importance to the illuminating engineer in working out his scheme. The question of reflection is material, as Mr. Woodwell himself says, though, probably through the obvious limits of a paper, he does not deal with it to any great length.

It is possible that other papers may follow on this question, with diagrams both of the polar and Rousseau types, showing the influence of the character, tint, and shape of reflectors in increasing illumination in any particular direction. Reflection, because of its varied nature—direct, diffuse, and selective—offers a large field for discussion; and the evident regard paid by the authors to gains from this source, warranted a fuller treatment. One speaker points out the possibility of considerably increasing illumination by means of a reflecting surface of plaster of Paris. Any ordinary table of co-efficients of reflection will bear him out as to the possibilities of such adventitious aids, though so large a percentage gain as he has claimed is surely improbable. Some allowance must always be made for the comparative roughness and unevenness of the surface, its accumulating dirt, and discoloration. Mr. Woodwell, in referring to the gains due to diffuse reflection from walls, ceilings, &c., gives the formula $K = \frac{1}{1-C}$ (where C is the coefficient of reflection), as representing its value; stating that for large interiors this may lie somewhere between 1·25 and 1·50. If one is not mistaken, this gives C as high a value as 0·20 to 0·33 as the coefficient, which suggests in the case of large interiors, or halls, a very fair gain in illumination effect by the single means of reflection. The author does not give the factor for smaller rooms; but it may be taken that here the reflective effect would be much greater, especially in the case of light-coloured papers and white ceilings, the illumination being probably increased two or three times, as he suggests. This matter is of greater importance than the losses due to the obliquity of light rays with which Mr. Woodwell deals more fully. Dr. Bell deprecates the too frequent use of the cosine law in calculating the illumination effect, and rightly points out that oblique light is seldom used for reading or ordinary work, since one places a book or paper in such way as to use normal light rays. The paper includes full formulæ for ascertaining not merely the illumination due to oblique rays, but the accumulative effect of a number striking the same surface; the illumination due to oblique rays carrying the process to what would appear to be an unnecessary point of refinement, particularly in view of the slight treatment given to reflected light.

The subject of the intrinsic brilliancy of lights raises a question which should by degrees force itself to the notice of the thinking public. It is commendable that the members of the Illuminating Society have not lost sight of it. We are all becoming accustomed to higher grades of light brilliancy; and unfortunately, as Dr. Seabrook remarks, the tendency is to demand greater intensity as soon as the eyes become fatigued. What the effect will be in the future it is difficult (yet perhaps not difficult) to say, unless lighting engineers steadily seek to distribute light effectively—that is to say, where it is required, without necessarily having intense, and sometimes wastefully intense, sources of light. The general public requires high foot-candle illumination; and this is frequently achieved by the simple expedient of fixing a number of high-power arc or gas-lamps without regard to the effect of the brilliant points or surfaces of light upon the eyes. The problem lies before the lighting fraternity—that of getting good illumination without wasting the initial candle-power possibilities of the light. Shaded light-sources afford good means; but it cannot be, and is not, economical to produce powerful lights, and then tone down, or in other words partially destroy, their intrinsic brilliancy by opal or similarly heavy glass globes. Mr. Woodwell gives this as one alternative. The other is the location of the light-source out of the line of direct vision, securing the desired illumination partly by diffuse reflection.

The table of intrinsic brilliancies is useful; and it is interesting to know that the candle-power brilliancy per square inch of an incandescent gas-burner is lower, and therefore more in its favour, than that of any electric light in ordinary use. It is said that the Welsbach light has a brilliancy of from 20 to 25 candle power per square inch of surface, which is nearly equal to that of brilliant sunlight reflected from a horizontal white card. It is obvious that this is too much for direct vision; and any increase in intensity of the light-source makes it the more important that the illumination for one's work should be indirect in character. Before leaving this question, however, it may, in view of the mere physiological aspect, be some guide, by way of contrast, to remark that the comparative brilliancy of the horizontal white card under a dull winter sky is 0·26-candle power per square inch. This is obviously low. Mr. Woodwell states that a brilliancy in excess of 5 or 6 candle power per square inch produces fatigue and irritation of the eyes; and Dr. Bell had suggested 5-candle power as the maximum for direct vision—giving, however, half this value as preferable.

As will be seen, the papers read before the Illuminating Society are suggestive of much that is distinctly useful in matters of illumination; and they are practical in that they also include a number of concrete cases in which the principles enunciated have been borne in mind. The examples themselves, since they are clearly described and accompanied by both photographs and diagrammatic illustrations and curves, afford sufficient matter alone to warrant presentment for discussion.

Proceedings of the Thirty-Fifth Annual Meeting of the Italian Gas Society.—The "Transactions" of this *quasi*-international gas gathering, which was held in Milan last year, and of which an account was given in the "Journal" for Sept. 18 (p. 759), have just been issued in bound form. We note from the list of members that these now number 135, which shows that there is still plenty of scope for enlarging the membership of the Association. The text is given of the petition to the President of the House of Deputies against the proposed enactment for the periodical examination of gas-meters; and among other appendices are the report of Signor Beria on the question of a municipal tax on gas at Turin, and a note by Signor E. Zuccoli on the conditions of employees in works which have become municipalized. The paper presented in the international competition, on "A Comparison of Horizontal, Inclined, and Vertical Retorts," was fully given in the "Journal" at the time (see Vol. XCV., p. 768). The drawings, however, accompanying the paper, which it was thought might be reproduced in the volume of the year's Transactions (as noted p. 768 above), are not even now given, notwithstanding that there are references to them in the text. This is an oversight that we think might have been remedied; and had the drawings been included, the value of the paper and of the published proceedings would have been enhanced.

GAS BILLS FOR 1907.

First Article.

Commencing to-day our customary notice of the Bills that have been deposited for promotion in the ensuing session of Parliament, we deal first with those Companies seeking constitution as statutory concerns.

Portions of the urban district of Annfield Plain, in the county of Durham, have for many years past been supplied with gas from private gas-works situated at Kyo and Dipton, which works are owned by Messrs. W. A. Schultz and C. Comins; and it is now contemplated that these private works shall be transferred to a Company to be incorporated under the title of the Annfield Plain and District Gas Company. Messrs. F. Bridges. C. Comins, W. Hazell, W. C. Parkinson, R. Stapley, W. A. Schultz, H. C. Walker, S. T. Williamson, and others, are desirous of being united into a Company, and to have stututory powers conferred upon them, in order that they may properly provide for and develop the gas supply of the district. Turning to the provisions of the Bill, it is seen that section 13 of the Gas-Works Clauses Act is to be supplemented by the words: "Provided also that every such contract entered into by the Company shall be alike in terms and amounts under like circumstances to all consumers." This, as was recently pointed out in the "Journal," will obviate, in accordance with the last issued model clauses, any necessity for the prescription of specific discounts. The limits of the district of supply are defined. The capital proposed is £45,000, with one-third borrowing. Insurance, reserve, and renewals funds are provided for. Land is scheduled for the purpose of gas-works; and power is required for the purchase, by agreement, of not exceeding an additional 5 acres. The standard price of gas is to be 4s. 3d. per 1000 cubic feet; and the sliding-scale will operate half-yearly, with penny alterations of price carrying 2s. 6d. per cent. changes in dividend. For prepayment supply 10d. per 1000 cubic feet for meter and fittings, 1s. with cooker, and 10 per cent. on cost of meter for meter alone, are the charges proposed in excess of the ordinary price of gas. The illuminating power of the gas is to be 14 candles, tested by the Metropolitan argand burner No. 2, a bar photometer, and Harcourt's 10-candle pentane lamp. It is noted that—

If the illuminating power of gas supplied by the Company shall be below the prescribed number of candles to an extent not exceeding half-a-candle, the Company shall not be liable to any penalty in respect of such deficiency, and if such illuminating power shall be below such prescribed number of candles to an extent exceeding half-a candle, but not exceeding one candle, the penalty to which the Company shall be liable in respect of such deficiency shall be not exceeding five pounds.

The remaining clauses are of the ordinary character. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

Incorporation and the usual statutory powers are sought by the Boston Spa Gas Company, Limited. The Company have a present capital of £4000; and they have borrowed money amounting to £2300 upon debentures, bearing interest at the rate of 4 per cent. per annum. The Company supply within Boston Spa, and in certain adjoining parishes, including Thorp Arch. As is the general experience, demand is increasing. Hence this application for incorporation and statutory powers. The parishes of Thorp Arch and Walton are within the area of supply of the Tadcaster and Wetherby Gas Company, Limited; but as no supply of gas has been given to these parishes under the Tadcaster Order of 1883, the Boston Spa Company ask for the repeal of the powers. From time to time, the Company have expended various sums of money, out of profits, on the improvement and extension of their gas plant and other appliances; and in view of the present application to Parliament, they have caused a structural valuation to be made of their works, which valuation, together with the working capital, now amounts to £8300, or thereabouts. It is therefore thought reasonable that a sum of £2000 of ordinary stock, representing the aggregate amount of the sums so expended, should be created and distributed rateably among the present shareholders. Provision for this is accordingly made. The Bill prescribes the extended limits of supply, and provides for the vesting in the Company of the property of the limited concern. Capital is sought to the extent of £12,000, whereof, it is suggested, £6000 should be the original capital, and be distributed among the shareholders at the rate of £150 for each £100 of capital at present held, and £6000 should be the additional capital, of which preference shares should not exceed £3000. Inclusive of the £2300 already borrowed, the Company desire to borrow up to one-third of the amount of the issued capital. The standard rate of dividend on the original capital is to be 10 per cent., and on the additional ordinary capital 7 per cent. For preference capital, 6 per cent. is named. Reserve, insurance, and renewals funds are provided for. It is intended that new issues of capital should be first offered to consumers or employees. The gas-works lands are scheduled; and power to purchase by agreement up to 10 acres of additional land is asked. The standard price of gas is placed at 4s. 11d. per 1000 cubic feet; penny variations in price in respect of any year to carry 2s. 6d. per cent. changes in dividend. The standard illuminating power of the gas is put at 14 candles; and testing is to be by the "Metropolitan" argand burner No. 2. Leave is asked to apply for a Provisional Order; and the Directors request authority to fix the remuneration of the Secretary. [*Parliamentary Agents: Messrs. Baker and Co.*]

In the Brockenhurst Bill, we have a proposal for the incorporation of a Company for the supply of gas in the parish named, in the county of Southampton. There are four persons mentioned in the Bill, as well as "other" persons, who have subscribed, and desire to be united in a Company. The limits of supply are only to be the parish of Brockenhurst; but the capital asked for is £15,000, with £5000 borrowing powers. About 2½ acres of land are scheduled for works; and powers to purchase 5 acres by agreement are sought. The maximum price of gas is suggested at 5s. per 1000 cubic feet. It is intended that the standard illuminating power shall not be less than 14 candles; but the burner that it is desired to be prescribed is Sugg's "London" argand No. 1, or other burner approved by the Board of Trade. All other clauses are of the ordinary character. [*Parliamentary Agents: Messrs. Baker and Co.*]

Persons named in the Bude Bill, and "others," are also desirous of being incorporated in a Company, and having powers conferred upon them, for the purpose of providing a proper and sufficient supply of gas to the Urban District of Stratton and Bude. One of the first things noticed in this Bill is that section 13 of the Gas-Works Clauses Act, 1847, is extended by the provision quoted in the Annfield Plain Bill. The limits of supply are defined. The capital contemplated is £15,000, with £5000 as borrowing powers. Land extending to 1⅝ acres is scheduled for gas-works purposes; and it is sought to hold power to purchase by agreement up to 5 acres. The maximum price for 14-candle gas is proposed at 5s.; and Sugg's London argand burner No. 1, or such other burner as is approved by the Board of Trade, is intended to be prescribed. [*Parliamentary Agents: Messrs. Baker and Co.*]

The history of the Grays Thurrock Gas Company, in the making of which various Provisional Orders have assisted, takes up a large amount of space in the preamble of the Bill promoted for the incorporation of, and the conferring of powers upon, the Grays and Tilbury Gas Company. We will content ourselves with saying that up to the present the Company have created and issued 1000 £10 shares, bearing a 10 per cent. maximum dividend, and 5400 £10 shares bearing a maximum dividend of 7 per cent. The Company have received in the way of premiums on the last-mentioned shares £3230, and have borrowed £14,275. In the Bill, it is remarked that section 13 of the Gas-Works Clauses Act, 1847, is also to be amplified in the manner proposed in the Annfield Bill. The limits of supply are described. The capital proposed is £200,000—the original capital to be represented by £10,000 of "A" ordinary capital and £54,000 of "B" ordinary capital; leaving as additional capital £136,000. Including the £14,275 already borrowed, the Company ask for power to borrow up to one-third the amount of capital authorized. The standard dividends are to be at the rates per annum of 10 per cent. on the "A" capital, and 7 per cent. on the "B" capital, and not exceeding 6 per cent. on the preference capital. Reserve, insurance, and contingency funds are provided for. The standard price of gas is proposed at 5s. within a radius of a mile of the gas-works, and 6s. beyond. Operating half-yearly, penny variations of price will carry 2s. 6d. changes in dividend on the 10 per cent. capital, and 1s. 9d. changes on the 7 per cent. capital. There is a discounts clause, but it reads as follows:—

The Company may, if they think fit, allow discounts to consumers of gas in consideration of prompt payment of gas charges not exceeding in any case 10 per cent. Provided that all discounts shall be of equal amount under like circumstances to all consumers, and that notice of any such discounts shall be endorsed on every demand note for gas charges. Provided also that, in the event of a discount given under the provisions of this section being made of an equal amount applicable alike without regard to the circumstances of the consumption to all consumers of gas by means of ordinary meters, the standard price for the purposes of this Act shall be the price charged to such consumers, less the said discount.

The illuminating power proposed is 14 candles, tested by the "Metropolitan" argand No. 2, with a table photometer and Harcourt's 10-candle pentane lamp as the standard. The existing gas-works site is scheduled, with an additional 6½ perches of land adjoining; and land purchase powers by agreement are asked for up to 10 acres. [*Parliamentary Agents: Messrs. Baxter and Co.*]

There is no supply of gas within the urban district of Llandrindod Wells and other places adjacent thereto, in the county of Radnor; and as it is, of course, expedient that a supply of gas should be afforded to the inhabitants of these places, Messrs. W. C. Parkinson, Charles Hunt, F. R. Smith, and C. E. Murray, and other persons who have subscribed, desire to be united into a Company, and incorporated by the name of the Llandrindod Wells Gas Company. Section 13 of the Gas-Works Clauses Act is to be extended in the manner already referred to in preceding notices. The capital proposed is to be £15,000, with one-third borrowing powers. A renewals fund is provided for. About 6 acres of land are scheduled for the works, and power is asked to purchase up to 5 acres additional by agreement. Clauses are inserted for the protection of the London and North-Western Railway Company. The maximum price of gas is put at 4s. 6d. per 1000 cubic feet, with the now usual clause applying to prepayment meters—viz., 10d. excess on the ordinary price for prepayment meter and fittings, 1s. excess when a cooker is included, and 6d. for meter alone. [In the latest model clause 10 per cent.

on cost of meter is mentioned instead of 6d.] The illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" argand burner No. 2, a bar photometer, and Harcourt's 10-candle pentane lamp. It is proposed that there shall be no penalty for the first half-candle deficiency in illuminating power; the clause being in similar terms to that quoted for the Annfield Plain Bill. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The next Bill to notice is for the incorporation of the Selsey Water and Gas Company, and to enable the Company to supply water and gas in certain parishes in the County of Sussex. There is no water supply in the parishes of Selsey, Sidlesham, Pagham, and North Mundham, though they are within the area defined by the Chichester Corporation Water Act, 1897. The Petersfield and Selsey Gas Company are affording a supply of gas within the parish of Selsey, as well as within the town of Petersfield. As Selsey is more than 20 miles from Petersfield, and the two places have little in common, it is proposed that the Selsey portion of the undertaking of the Petersfield Company should be transferred to the proposed new Selsey Water and Gas Company, and that they should have and exercise the powers now possessed by the Petersfield Company of supplying gas within the parishes named above. The capital of the Petersfield Company at present consists of £30,000, of which £16,000 is ordinary capital and £14,000 preference; while, in addition, a sum of £7500 has been raised by way of mortgage debentures. The liability to repay these debentures it is intended to apportion between the two Companies—the Selsey Company's liability in this respect being named at £2500. It is proposed that the capital of the Selsey Water and Gas Company shall be £24,000, with £8000 borrowing powers. [The water portion of the Bill will be left for treatment when noticing the Water Bills.] With regard to the gas section, the limits of supply are described; and full provision is made for the purchase by agreement or arbitration of the Selsey portion of the Petersfield gas undertaking. The maximum price of gas is placed at 5s. for 14-candle gas, which it is purposed to test by Sugg's "London" argand No. 1 burner. The Bill provides for the shortening of the title of the Petersfield Company by the omission of the words "and Selsey." [*Parliamentary Agents: Messrs. Baker and Co.*]

The Shanklin Gas Company, Limited, are desiring to be dissolved and reincorporated, with statutory powers. The capital consists of the original share capital amounting to £10,000, and additional capital to like amount, in addition to which the Company have borrowed £5000. Section 13 of the Gas-Works Clauses Act, 1847, is to be amplified in the manner described in connection with other preceding Bills. The limits of supply include Shanklin and Whitwell, and portions of Brading, Sandown, and Newchurch. All the usual provisions appear associated with the vesting of the property in the incorporated Company. The capital, it is proposed, shall consist of £66,000 of consolidated ordinary stock (bearing a standard rate of dividend of 5 per cent. per annum), whereof £34,000 is intended to be divided among the shareholders of the Limited Company—that is to say, £20,000 among the holders of the shares entitled to 10 per cent. dividend, and £14,000 among the holders of shares entitled to 7 per cent. dividend. The additional capital will then amount to £32,000. Including the £5000 already borrowed, the Company desire to borrow up to one-third of the nominal amount of the consolidated ordinary stock, and up to one-third of the additional capital. With a standard rate of dividend of 5 per cent., and a standard price of 4s. 6d. within a radius of 6 furlongs from the main entrance of the gas-works (beyond, it is to be 5s.), the sliding-scale will operate on a basis of penny reductions or increases in price carrying increases or reductions (as the case may be) of 1s. 3d. per cent. in the dividend. For prepayment supply 10d. for meter and fittings, 1s. including cooker, and 6d. for meter alone are the charges proposed in excess of the ordinary. The old clause prescribing 10 per cent. discount for prompt payment and 15 per cent. for large consumption is included in the Bill. The illuminating power of the gas is prescribed at 14 candles—testing being by the Metropolitan argand burner No. 2, a bar or table photometer, and the Harcourt 10-candle pentane lamp. Insurance, renewal, and reserve funds are provided for. Sanction to an application for an Electric Lighting Provisional Order is asked. [*Parliamentary Agents: Messrs. Torr and Co.*]

Mr. Henry Swingler, for some years the Chairman of the Derby Gas Company, and whose death was announced in the "JOURNAL" last September, left estate valued at £361,023.

The German Associations of Engineers, Engineering Firms, and Large Gas-Engine Builders have issued a series of rules and regulations which are to govern in future the efficiency and output tests of gas-engines and gas-producers. They are given in detail in the "Zeitschrift des Vereines Deutscher Ingenieure," and their object is to render uniform the conditions under which tests of these installations are carried out, with a view to get results comparable with others obtained on the same basis throughout the country. The regulations state the points on which the tests are to bear, both as regards producers and engines. The Committee who had charge of the preparation of the regulations included prominent German gas-engine builders and professors, among whom are Mr. E. Körting, jun.; Herr Richter, the Chief Engineer of the Nuremberg Gas-Engine Works; Herr Stein, the Director of the Deutz Works; and Drs. Stodola and Th. Peters, of the Verein Deutscher Ingenieure.

ACCOUNTS OF MUNICIPAL AUTHORITIES.

IT may be remembered that about twelve months ago the President of the Local Government Board (the Right Hon. John Burns) appointed a Departmental Committee, with Mr. Walter Runciman, M.P., as Chairman, on the subject of the accounts of local authorities. The Committee completed the taking of evidence last August; and since then they have held a large number of meetings, at which they have been considering their report on the first and second sections of the reference—viz., the systems on which the accounts are at present kept, and that on which they should be kept. The Committee were to inquire particularly whether or not the accounts should be prepared on a system requiring the entries of receipts and payments to be confined as far as possible to actual receipts and payments of money. Their report on these matters has just been completed, and it will probably be presented after the holidays; while their recommendations on the third section, dealing with the regulations which should be made on the subject—regard being had to the necessity for showing accurately the amounts raised by local taxation and the purposes for which they are applied—will be made known in the spring. Without attempting in any way to forecast the conclusions of the Committee, it may be supposed that they will contain a recommendation for a simplified form of accounts. But whether or not they do so, an attempt in the direction of simplification has been made by Major-General H. P. Babbage, in a pamphlet, entitled "The Bitter Cry of the Ratepayers," of which we have received a copy from the publishers, Messrs. Gee and Co., of Moorgate Street. The remedy suggested for this "bitter cry" is an intelligible system of accounts, with full publicity and a Government audit. Taking the last matter first, the author points out that the auditor deals with the accounts after the money has been spent and the mischief done. It is, of course, far better to provide some check beforehand; and the problem is to find out how this may be effected. The first thing is to have a clear definition by law of the powers and duties of a town council; and the next to stimulate the ratepayers in the selection of capable representatives.

Dealing with the subjects of municipal administration and finance, the author says the dominant idea should be to make out the accounts in a uniform shape, applicable to every borough, and as intelligible as possible to the ordinary ratepayer. With this view, he thinks the national Budget system should be adopted as far as practicable. He advises the preparation of a monthly statement, containing in one column the names of the payees of cheques and the amounts due to each, and in the other the items dissected according to the Committees responsible for them. The totals of the two columns should, of course, agree. Examples of these statements are given, and the author explains that they must be dissected and rearranged under the budget heads. The result will, he considers, be a set of accounts which are nothing more than a classified list of receipts and payments which any ordinary ratepayer will be able to understand. But in order to bring them together, and to give a double entry, there should be an abstract from the bank pass-book for the year and a summary of all the separate accounts. Major Babbage next shows how the income and expenditure accounts can be worked out from the receipts and payments by incorporating with them the outstanding balances at the end of each year. Passing on to deal with the estimate for the rate, he points out that no rate can be made, under either the Municipal Corporations Act, 1882, or the Public Health Act, 1875, which includes items both prospective and retrospective; the object being to make the rates for the year cover the expenses, and to secure careful management. Yet he says that in some boroughs "this salutary provision is habitually disregarded, and ratepayers are deceived as to the true poundage of the rate." In the case of the authorized trading undertakings of a local authority, such as gas, electric lighting, or water supply, the budget should take the place of the estimate for the rate. Under the management suggested by the author, he thinks no "wild cat" scheme could be suddenly brought forward and adopted without due consideration and regard to expense.

On the subject of capital, which for the trading undertakings of a corporation can only be obtained by loan, the author emphasizes the necessity of keeping it distinct from the revenue, as shown in the summary of receipts, payments, and cash balances, in which it will take its proper place. The accounts of the sinking funds should also be kept entirely separate from all others. Forms of the sinking fund accounts as proposed are given; and these are followed by some remarks on auditing and the duties of elective auditors. The audit by the latter, the author says, resolves itself for the most part into a verification of the arithmetical accuracy of the figures, which is unnecessary, "because the accounts may be so arranged as to show double entries and prove themselves to the eyes, and so satisfy the ratepayers of their correctness; and next because an error very rarely occurs." The real work of the auditor comes after the arithmetical test is completed. It sometimes happens that one of the elective auditors will not sign the report of his colleague. An instance of this is given; and Major Babbage says such audit can be of little use, especially if the accounts are reliable, and arranged on a proper system of double-entry and coherence and continuity. The author concludes by advising property-owners and ratepayers' associations to be wide awake and aggressive,

and to do the best they can under the law as it stands if they cannot get it altered. Boroughs should, he says, select as their elective auditor a qualified and resolute man who will report to the Council and to them all irregularities. But he points out that the ratepayers should not "think in pence," but pay their auditor sufficient to attract a competent man.

THE IRON AND STEEL TRADES IN 1906.

The past year has been one of rising prices for metals generally—and for copper and tin especially—and this, it must be remembered, in its turn followed a twelvemonth of substantially improving conditions. As regards the iron and steel trades, business everywhere has been on a very large scale indeed. But while the past, of course, is interesting from an historical point of view, it is with the future that both buyers and sellers are chiefly concerned; and thus the question of what is likely to happen this year, is very much more important than the consideration of what occurred last. It is therefore enlightenment on this point that we seek first of all on opening the annual report of Messrs. Bolling and Lowe—who have in the past proved themselves capable of forecasting "coming events" with a praiseworthy degree of accuracy. On the present occasion, then, we find that the firm, referring to pig iron, give it as their opinion that there is no reason to anticipate, in the next few months at least, a reversal of the present favourable conditions. For six months, it is felt that the situation is assured; but that further than this it is risky to hazard conjectures.

As to the steel rail market, the report states that prices have been maintained at the rates fixed by the International Syndicate; and though the demand has not been all that manufacturers could desire, they have doubtless benefited more by the higher prices attained, as the result of the Syndicate, than they would have done by a larger output at competitive rates. This country is about to lose an old customer in the shape of the Swedish State Railways, as plant has been laid down in that country for the rolling of rails; while another feature of importance is the process of rolling down old rails into sleepers, which, if it is generally adopted, will kill the wood sleeper trade. The decrease in rail exports from England up to the end of October, as compared with the previous year, amounted to about 70,000 tons. Joists and structural material substantially advanced in price during 1906; the San Francisco earthquake being largely responsible for this—as it was also for a fillip to the cement trade. In the event, however, the anticipation that large quantities of beams, &c., for the re-building of the city would be purchased in Europe, was not realized, though several purchases were made. It is now thought probable that the United States will themselves supply the requirements.

In the pig iron trade, the feature of the year was the demand by America for supplies from this country. Predictions had, say Messrs. Bolling and Lowe, been indulged in for many months that the United States would be compelled to supplement home supplies by drafts made upon foreign producing centres; but the hope had so often been doomed to disappointment that a feeling of lassitude was everywhere maintained, till it became apparent that the United States blast-furnace men were no longer able to satisfy the hunger of home consumers. Many thousands of tons of Scotch iron—which is the class chiefly favoured by Americans—have already been purchased; and the speculative buying which ensued in this country on these transactions becoming known, considerably raised prices. In Germany, also, manufacturers found themselves unable to cope with the demands, and extensive shipments were made from this side. In fact, it is remarked that the year has been one of unprecedented prosperity for Germany in the iron and steel and kindred trades; and in almost all branches orders have been booked so far ahead that nothing in the way of new work can be taken in hand before well into 1907.

These branches of industry are also in a very flourishing condition in both France and Belgium. General trade in the United States is, as we know, prosperous; Mexico is continuously growing commercially; while the state of affairs in Canada and the Commonwealth of Australia is gratifying in the highest degree. Messrs. Bolling and Lowe, indeed, sum up the situation by remarking that the general result of 1906 may be taken all round as very satisfactory; and those countries whose staple industries are the production of iron and steel, and the cultivation of allied trades, have had a time of exceptional prosperity. Most other countries, and those Colonies whose well-being depends upon agricultural productions, have also very little to complain of, so that the year 1906 may be looked upon as one of special prosperity to almost every civilized nation.

It is stated that the past year's production of pig iron in this country has approximated 10 million tons. This compares with about 9½ million tons in the preceding twelve months. The value of the exports of iron and steel for the eleven months ending on Nov. 30 in each of the past three years has been as follows: 1904, £25,911,557; 1905, £29,561,408; 1906, £36,917,985. At the middle of December, 1904, the price of hematite pig iron warrants was 56s. 2d. per ton; in 1905, 71s. 6d.; and in 1906, 80s. At the same dates, the figures for heavy steel rails were £4 10s., £6, and £6 10s.

ITALIAN TEXT-BOOKS ON GAS-ENGINES.

Some little while ago—on April 24 last year, to be exact—we commented, in "Editorial Notes," upon the comparative backwardness of Italian gas technicians to record their experiences in writing; and we regretted that Italian gas engineers had not played that prominent part in general technical literature that they might have done, and as their electrical *confrères* had. We hazarded the opinion that it was "merely a question of time before we see gas technics in Italy taking their proper place in current technical literature." Significantly enough, in the very same month, Signor Vittorio Calzavara, the able Editor of our Italian contemporary, "Il Gaz," was writing in a similar strain. We learn this from his preface to one of two Italian books* we have received dealing with gas-engines and poor gas. Signor Calzavara had previously endeavoured to remove the stigma referred to, not only by establishing in Italy his interesting monthly gas periodical, but by his text-book on the gas industry —"*Industria del Gaz Illuminante.*" He now follows this work up by one of some 400 pages and 160 illustrations, dealing with the subject of gas-engines. He commences his preface thus: "In my sufficiently long gas career, I have had opportunity of observing that in Italy there is a great deficiency in the study of gas matters. Yet this industry is a most important one, and by and from it so many other industries are driven and derived. In other countries, which are in the same front rank of progress, there are schools for gas men; and books on gas are not wanting. Here in Italy, there are no gas schools; and Italian books on gas are very scarce." This scarcity is now gradually being remedied.

The author gives a fairly ample and international bibliography of gas treatises, and he then proceeds to trace, in an interesting and exhaustive way, the origin and development of gas-engines. After classifying them, a chapter is devoted to the different kinds of gases that are used in internal combustion engines—from coal, water, and poor gas to blast-furnace gases, acetylene, petrol, and alcohol. The various mechanisms are afterwards described and illustrated; and the concluding chapter gives general instructions for the management and maintenance of gas engines. Altogether the book is a very useful and practical survey of an increasingly important subject.

The other Italian text-book that we have received—that by Ingegnere Fosco Laurenti—is, in some respects, the complement of the previous one. It looks at the subject of poor gas and gas-engines more, perhaps, from the point of view of the mechanical engineer. It fills in, in detail, the supplementary mechanisms and technical and constructional considerations that might not find a place in the former book. The author first considers fuel; then producers; and subsequently he devotes the bulk of his space to detailed descriptions of, and calculations relating to, the various organs and accessory appliances. Many tables and experimental results are given; and the book is certain to prove of great service to gas-engine students and designers, though an index might have added to its utility.

Both these treatises are issued by the well-known Milan publishing firm of Ulrico Hoepli, whose text-books fill a very similar place to that of the English Weale's series of scientific and technical works. The publishers are to be complimented on the educational function they are fulfilling in Italy; and the low price at which their neatly bound and well-printed publications can be bought, brings them within reach of all technical students.

* "*Motori a Gaz.*" By Signor Vittorio Calzavara. Ulrico Hoepli, Milan. "*I Motori ad Esplosione a Gas Luce e Gas Povero.*" By Ing. Fosco Laurenti. *Idem.*

A REVIEW OF MUNICIPAL TRADING.

Some four months ago, we briefly noticed a book by Mr. Hugo R. Meyer, of Chicago, which dealt with the effect of municipal trading on private enterprise; and now we have before us a recently published work by Lord Avebury (which has attracted a considerable amount of attention) treating mainly of the financial aspect of municipal enterprise.* The author is, of course, a well-known speaker and writer on the subject of his present book; and if any doubt existed—which it does not—with regard to the great weight that should attach to his utterances, the outcry of those who hold opposite opinions to himself would be quite sufficient to dispel it. There is, of course, much in his present work with which those who have been in the habit of listening to his annual addresses to the Industrial Freedom League have become familiar. But the arguments are of a kind that cannot be too often repeated; and, besides, the setting forth of the whole case against municipal trading—or rather heavy municipal indebtedness—in a compact volume like the one under review cannot fail to be of assistance to all who wish to make a comprehensive study of the question, to whichever side their sympathies or their convictions may tend to lead them.

Everybody will not agree with Lord Avebury's conclusions—it is not to be expected that they should do so; and perhaps some

* "On Municipal and National Trading," by the Right Hon. Lord Avebury, P.C. Macmillan and Co., Limited. London; 1906. 5s. Net.

may even challenge his facts. But however this may be, a brief indication of the contents of the book will no doubt induce those who are interested in the subject to read it for themselves; and so we will content ourselves with this. Those who hold opinions on anything like the same lines as Lord Avebury's will be grateful to him for his vigorous championship; and even those who do not find themselves in accord with all that he says, will nevertheless feel that he has done good work in so prominently discussing the matter. As has already been mentioned, financial considerations occupy a large proportion of the eleven chapters of which the volume is composed; and the rapid increase in local expenditure of recent years is his text. But the monetary aspect, although of very great importance, is not, he shows, by any means all that has to be taken into account. In fact, he sets forth five grounds on which he holds that the running by municipalities of commercial undertakings is mainly undesirable. These (which it may be remembered he quoted at the annual meeting of the Industrial Freedom League last July) are as follows: Firstly, the legitimate functions and duties of the municipalities are already quite enough, if not more than enough, to tax all their energies and fill up all their time. Secondly, it has involved, and will involve, an immense increase in municipal debt. Thirdly, it will involve municipalities in labour disputes. Fourthly, as there will not be the same stimulus to economy and attention, there will be a great probability, not to say certainty, that one of two things will happen—either there will be a loss or the service will cost more. The working classes will, of course, be the greatest sufferers. Fifthly, it is a serious check to progress and discovery. It should, however, be borne in mind that in all that is said in support of these contentions, it is not persons who are attacked, but the system. It is argued that governments and municipalities cannot work as economically as private enterprises, and that therefore municipal trading must increase the rates more and more. The author says: "It has been a surprise to many that, while our commerce is undoubtedly flourishing, the distress this year [1906] should have been above the average. Is not one reason the crushing weight of rates and of taxes? We are paying £68,000,000 a year more in taxes (and about the same amount more in rates) than we were ten years ago; so that between the two we are paying £130,000,000 a year more."

Under the heading of "The Duties of Local Authorities," the varied work of the London County Council is set forth; the items on the *agenda* for one particular meeting (which, however, was about twice the usual length) being enumerated. On this occasion there were 38 reports of Committees and over 500 resolutions to be passed by the Council in one afternoon. This is altogether apart from the duties undertaken by many of the members of the County Council on the Metropolitan Water Board and the Thames Conservancy. On the subject of the increase of municipal debt, it is unnecessary to say anything here. Readers of the "JOURNAL" are fully acquainted with the figures. In the chapter on "Labour Questions," a matter is drawn attention to which has been commented upon in many quarters—the enormous influence which municipal employees can exert at local elections for purely personal objects. The truth of this will be manifest, when it is mentioned that already in some cases the municipal employees account for 5 per cent. or more of the total number of voters. After dealing with the housing of the working classes, the reader is brought to a consideration of the question of "Loss and Profit," in which tramways, gas-works, and water supply are specially dealt with, as being the cases "which are generally put forward as affording the strongest illustrations in support of the supposed advantages of municipal management." This matter of profit and loss is, of course, one of the most contentious of all the aspects of municipal trading; and it is impossible to go over all the ground here. Suffice it to say that Lord Avebury quotes the Provincial Company and Corporation prices from "Field's Analysis," and concludes that "in places supplied by companies, gas is substantially cheaper than where it is in the hands of the municipality." But it is true that circumstances vary in different cases; and Lord Avebury admits that, in comparing gas undertakings, there are several things besides the price of gas to be considered. These, however, he does not in any way regard as weakening his case for company management. He thinks that the sliding-scale system seems better for the ratepayers than municipal management; while another important point is that where the gas is supplied by companies the municipalities watch jealously over the quality, "but where it is supplied by the municipality we have no such guarantee." So far as water supply is concerned, the author grants that sometimes municipal management is desirable; and that this is perhaps the strongest case for municipal enterprise.

The remaining chapters of the book deal with the "Effect of Municipal Trading on Private Enterprise," "Railways," "Interests of Working Men," and "Representation without Taxation, and Taxation without Representation." We must, however, leave these, and content ourselves with quoting the conclusions (beyond the five main objections to municipal trading contained in the opening chapter) set forth at the end of the book. They are as follows: That profits are only made (if at all) when municipalities have a monopoly. They are confined to business such as the manufacture of gas, which has long been established and reduced to regular rules. That even in such cases the accounts have been so kept as to make it impossible to determine what the real result has been. That the profit (if any) has been but small; and that much more satisfactory and remunerative results might have been obtained if the works had been leased to private companies or firms. That it is unwise to give votes to those who pay no rates, and unjust to withhold them from those who do. That by reducing the demand for labour, while increasing prices and raising rates, municipal trading has not only injured the ratepayers generally, but especially the working classes; and if carried to its logical conclusion, it will involve the loss of their freedom. The recommendations of the author are a uniform system of accounts for local authorities; votes for companies in some reasonable proportion to the rates they pay; and, most important of all, that "when the debt of a local authority exceeds the rateable value by a certain proportion, their stocks should be removed from the list of trustee securities."

Lord Avebury, in support of his arguments, quotes largely from the speeches and writings of various people; and the book is certainly none the less interesting on this account.

RELATIVE VALUE OF STANDARDS OF LIGHT.

At the request of the International Commission on Photometry, investigations have been made in the experiment laboratory of the Conservatoire des Arts et Métiers, by MM. Perot and Langlet, and in the Laboratoire Central d'Électricité, by MM. Laporte and Jouaust, with the view of obtaining an exact idea as to the relations existing between the values of the standards of light used in different countries; and the results of their investigations have lately been published in the "Comptes Rendus." The measurements were made either directly by the simultaneous comparison of three sources of light—the Harcourt, the Carcel, and the Hefner—one with the other, or indirectly by comparing them with an intermediary electric light. In order to obtain harmony between the operations carried on with very different degrees of humidity (varying from 10 to 18 litres of aqueous vapour per cubic metre of dry air), it was recognized that the intensity of the Carcel lamp was affected by the moisture in the atmosphere in the same manner as the two other light sources; and the necessary correction was made for it. This having been done, the results of the measurements made are as follows:—

	Harcourt-Carcel.	Hefner-Carcel.	Hefner-Harcourt.
Direct measurements. .	1·009 ..	0·0932 ..	0·0933
Indirect ,, . .	1·000 ..	0·0929 ..	0·0929

It may be remarked that the product of the three relations, identical with unity in the indirect measurements, might have systematically differed from unity in the direct measurements, if the tints of the lights had influenced them. This effect, if it exists, is entirely masked by the accidental errors. In this respect, the direct comparisons had a certain interest, as their agreement with the indirect measurements demonstrates that, for the light sources studied, each of them may be specified by a number which can be introduced into the numerical calculations, though it is the result of a physiological impression. In short, taking the average of the results given by the two methods, we have the following table:—

	Value of Lamps.		
	Carcel.	Harcourt.	Hefner.
Carcel	1 ..	1·004 ..	0·0930
Harcourt	0·996 ..	1 ..	0·0931
Hefner	10·750 ..	10·740 ..	1

These investigations, the authors say, have once more brought into evidence the difficulties attending the employment of the existing light standards (the accidental variations of which may be great), which necessitate corrections, and have proved the value which a standard based upon a physical phenomenon as independent as possible of exterior conditions—*e.g.*, the Violle—would present.

Inter-State Water Rights in America.—Inter-state water rights are involved in an important decision recently given by the New Jersey Court of Errors and Appeals. In 1905 the Legislature enacted a law prohibiting the diversion to other States of any of the potable waters of New Jersey. The Hudson County Water Company made a contract with the City of New York to furnish the borough of Richmond with a supply of water from sources controlled by the East Jersey Water Company. The Attorney-General of New Jersey brought an action to restrain the Hudson Company from carrying out this contract, on the ground that it was a violation of the Act mentioned. The Company contended that the Act was unconstitutional; and it is this contention that the Court of Final Jurisdiction has just overruled. The Court pointed out that common law recognizes no right in the riparian owner, as such, to divert water from streams in order to make merchandise of it; and the State has not, by statute, changed this rule. On the contrary, the legislative policy has been to preserve and administer the waters of the State for the benefit of its rapidly-growing population. There is no provision of the Federal Constitution violated by the law of 1905; and consequently the Hudson Company have no right to contract to deliver any potable water from the State of New Jersey to New York City.

SIR ALEXANDER KENNEDY ON SPECIFICATIONS, CONTRACTORS, AND CORRUPT COMMISSIONS.

The Presidential Address which Sir Alexander B. W. Kennedy delivered to the Institution of Civil Engineers on Nov. 6 last, has just been circulated in pamphlet form among the members. A brief outline of this interesting, and rather unique, presidential utterance was given in the "Journal" for Nov. 13 (p. 447), and was again referred to in our editorial columns on the 27th of the same month. We particularly referred to Sir Alexander's comments on the drafting of specifications, and the relationship between engineers and contractors. As these topics—though frequently dwelt upon—are of present and permanent interest, readers may care to have brought to their notice, in fuller form, the remarks upon them of the President of the Institution of Civil Engineers. Upon the subject of specifications, he says:

All engineering work of importance is carried out according to both a specification and a contract. An engineer prepares the specification and is practically responsible for the contract; while very often other engineers—from the manufacturing side—accept both documents, and undertake to work to them. There is little doubt that the more strictly legal—which means in this case equitable—the conduct of both parties is in reference to these documents, the less the probability that the aid of the purely professional lawyer will have to be called in later on.

On the manufacturer's side there is one chief and simple, but absolutely necessary, duty to perform in reference to these documents—namely, to read them. The duty is as simple and as obvious as "keeping your eye on the ball" in another phase of activity, and is just as often neglected. Hence many tears! If the contractor or manufacturer is dealing with a responsible and experienced engineer, he may be sure that the documents are intended to mean what they say, and that (barring mistakes) they do mean it. If, therefore, he finds that he cannot do what he is asked to do, there is nothing to be gained by slurring it over. The only means of avoiding trouble is the raising of all doubtful points before the work begins, so as to get them settled. If, on the other hand, the contractor is dealing with an irresponsible or inexperienced engineer, and no doubt there are such, it is all the more necessary that he should know exactly what he is asked to do. For in that case there may be meanings in the documents which only careful reading will discover, but which will certainly be taken advantage of, later on, against the contractor himself.

On the side of the engineer who draws up the specification, it is surely his duty, after drawing it up—after stating as clearly as possible his requirements—to endeavour to go through it from the point of view of the contractor, and make sure that there can be no reasonable doubt of the meaning of the words or phrases he has employed. This is every bit as true of the specification as of the contract. But whereas with the latter there is always legal help available, with the former the engineer has to trust to his own power of exact expression in saying just what he wants, and no more and no less than he intends to have.

The question of how much, or how little, to put in a specification is one about which no very general rule can be laid down. Naturally much depends on the engineer, on the contractor or manufacturer, and on the nature of the work. But, first and particularly, it is the duty of the engineer to define exactly what results he wishes to obtain. If he is unable to say what he wants, he can hardly be the right man for the work, and had better leave it alone. He can also say, quite exactly, the nature of the materials he requires to be used. In the majority of cases, he can also say in what way the work is to be carried out; what machinery or apparatus or appliances are to be used; and how they are to be arranged or applied. Or, if there are several ways in which his requirements can be met, he can indicate one of them, and leave the contractor to suggest others. No doubt, cases arise in which the requirements are such as can be fully met only by certain methods or appliances of a particular manufacturer or contractor; but as a rule a specification cannot be too full—it can certainly never be too clear—in dealing with general requirements and results. In details, however, it may very easily be too full; and no greater mistake can be made—nor any mistake more likely to lead to vexatious litigation later on—than to crowd a specification with detailed particulars as to matters which every competent contractor or manufacturer can carry out equally well in his own way. I would therefore put, as the characteristics of a good specification, definiteness and clearness always, fulness as to requirements and as to guarantees, freedom and openness as to those details and methods which are largely matters where contractors have had very varying experience.

We cordially endorse these views, which, indeed, have frequently been recorded, in varying phrases and at various times, in our columns. Especially would we commend the observation that it is the duty of the engineer, having drawn up his specification, "to endeavour to go through it from the point of view of the contractor." This may be a difficult task to some engineers, who have never had actual experience as contractors' assistants; but it is one that should be diligently gone through all the same.

Continuing, the President considered the position of affairs where the engineer is made the sole judge and interpreter of his own specification. This is a point that was also touched upon by Mr. C. E. Brackenbury in the paper he read, upon "Some Legal Notes on Contracts and Specifications," before the Society of British Gas Industries.* While there is general agreement in the views expressed, Sir Alexander Kennedy seems to think that, if an engineer "has said exactly what he wanted, in terms which could not reasonably be misunderstood . . . he can make his decision as fairly as if he were an arbitrator." This we hardly believe likely to prove to be the case, the fallibility of human nature being what it is. Even in such a case, the engineer would have to decide that his own language was not able "reasonably" to be misunderstood; and if the engineer's reasonableness of interpretation were the matter in dispute, it would surely be better to let the contractor have the benefit of an independent person's decision or opinion. We will give the presidential extract in full:

Personally, I have very strong views as to the inadvisability of making an engineer the arbitrator in relation to his own specification, although I know that some public bodies have different ideas. But even where the engineer is not the final arbitrator, there are sure to be many points of detail, in relation to the carrying out of the work according to the specification, which he solely will have to settle. And in these it is very desirable that his attitude should be as far as possible that of an arbitrator rather than of a party to a dispute. It is really here that the special importance of definiteness and clearness in the original wording of his specification comes in. If he has said exactly what he wanted, in terms which could not reasonably be misunderstood (if they had been reasonably and carefully read to start with), he can make his decision as fairly as if he were an arbitrator. But if his specification has not been clear, or has been insufficient to start with, his decision must necessarily be coloured by his own unexpressed intentions—his own view of what he meant; so that, although honestly given, it may not be by any means certainly the decision which an arbitrator would have given under the same conditions. Strictness, or even what is called severity, in a specification is not in itself against the interest of the contractor. As long as he can see what is wanted, it is his business to prepare for it. If the contractor presumes on the engineer being slack in construing his requirements, that is his fault; and he is rightly penalized when it turns out that he has caught a tartar. But a carelessly worded specification, or one in which important requirements are slurred over or only indicated inferentially, is unfair to the contractor, is unworthy of the engineer, and is likely to lead both into trouble as well as to result in unsatisfactory work.

The last topic to which we wish to draw attention is one that is much to the front at the present time—the subject of secret commissions. Though some may find Sir Alexander's phraseology upon this delicate matter not quite direct enough for their liking, his own opinions are not for one moment left in doubt; and with the warm support of the head of the engineering profession, coupled with the new legislation "for the better prevention of corruption," it is to be hoped that much will be done to uproot the cancerous growth that has sprung up in the commercial and professional life of the country. The President's observations are the following:—

With ordinary commercial life, every engineer stands in very close touch—the manufacturer, of course, directly, the consultant indirectly but hardly less intimately. We shall not go wrong, any of us, if we can only make up our minds that, as to our work, whether hand work or brain work, metal work or paper work—its quality is the first thing to be considered, and that, as to ourselves, no amount of profit is worth having if it is obtained by us as mere money-getting machines and not as gentlemen. We are rather fond of talking loosely of engineering as a "profession." I am not sure what authority is entitled to say whether engineering is or is not a profession. It must be a very young one certainly, if it is one at all. But by all means let us call it a profession, and then let us do our work accordingly. I fear it must be confessed that with some engineers things have occasionally not been thought unworthy or improper which, although not in themselves dishonest, would be impossible among lawyers or doctors, which ought to be impossible among gentlemen, and which would be impossible among ourselves if our organization were as complete, and our etiquette as strict, as in the older professions. I ask members of this Institution to keep before them—for their own sakes as well as for the honour of the Institution—an ideal of business or professional conduct at least as high as exists in the older and recognized professions of Law or Medicine, even although honourable behaviour cannot, among us, be enforced by legal penalties or disqualifications. Even the warmest admirer of free imports in the physical world will admit that in the world of ideas—which after all is the real world—there are some importations which we would willingly prohibit altogether. And for us engineers such an import (I hope it is not, after all, a native manufacture) is represented by the notion that an engineer may remain a gentleman in his private capacity, while in business affairs he habitually sets "smartness" before honesty, and money-getting before everything.

A concluding paragraph deals with an allied subject, and one with which the gas industry is, unfortunately, not altogether unfamiliar. It is the situation that arises where a man tries to be both a consulting engineer and a contractor at one and the same time. He endeavours to hunt with the hounds and run with the hare. Sir Alexander says: "Every such attempt, so far as I know, has ended in failure, and I am sure that the combination is to be deprecated." He would go so far as to say "that a consultant ought not even to hold shares in any manufacturing company with which there is the slightest chance that he may have to do in his professional capacity." This may sound a "counsel of perfection;" but we are quite convinced that such a high tone of commercial and professional morality as is so worthily and rightly held up by Sir Alexander Kennedy must be of the greatest benefit to the industry or community striving after it.

* See "Journal," Vol. XCIII., p. 644.

Lignite in gas-producers is reported by Herr H. Neumann, in the "Zeitschrift" of the Society of German Engineers, to be giving satisfactory results when the gas is cleaned. For example, at the 250 H.P. plant of the Kalk Chemical Works, a 321-hour test of a 70 H.P. generator was made, corresponding to a run of 1½ months, and only a very thin layer of soot on the exhaust-valve resulted, not causing any trouble in working. Brown coal briquettes were used.

THE TRANSFORMATION OF A RETORT-HOUSE AT LOWER SYDENHAM.

Those among us who knew the works of the South Suburban Gas Company (then the Crystal Palace District Gas Company) years ago, and whose acquaintance with them has only been renewed at long intervals, have some difficulty in recognizing in the modern works now to be seen there much likeness to the old. Old structures and old methods have given place to new. The change, however, has been a gradual one; the exigencies of circumstances demanded from the Board and their Engineer that, in the scheme of reorganization and modernizing, the utmost should be made of what existed, and that the alterations should be carried out with the least possible increase of the capital account. This has been done, and the Company are to be congratulated upon having a works thoroughly up-to-date, with the producing part equal to a considerable future accession of business. This has been accomplished at the lowest possible cost, consistent with good work, and with the minimum trespass upon capital. From time to time, it has been our privilege to describe portions of the work as it has proceeded; and now we are, through the facility afforded by Mr. Shoubridge, in a position to illustrate and give details of one of the retort-houses which is a central feature of the works to-day.

The Raison d'Etre of the House.

As one stands looking at one side of this house, with its fine length of 324 feet, there comes to mind the old place and its equipment which it supersedes, which in its early years was regarded as the most correct of structures for the purpose of carbonizing coal for the production of gas. But judged by the more exacting modern standard, that house was unfitted for proper working, and was uneconomical. Its walls and its roof are incorporated in the present building; and they are all the evidence that remains of its former working existence. There have been other retort-houses in the country that have had their roofs raised and walls heightened to make them suitable for present-day conditions; but we know of no other in the country that has been extended and altered as this has. For not only have the walls and roof been raised, but the house has been extended some 124 feet at one end. The house is equipped with one long bench of retorts, allowing the stoking machinery to be employed under conditions of maximum efficiency and economy.

The old house was 200 feet long by 70 feet wide by 23 feet high; and it contained twelve beds of sevens, and six beds of sixes. The retorts were worked by hand, and were heated by furnaces of the old open type. The settings, at the time the scheme about to be described was taken in hand, were practically exhausted; and, as has been intimated, they were too expensive to work, according to current notions and experience. From the bringing in of the coal to the depositing of the coke on the coke-heap, it used to cost with the old house 2s. 4d. per ton of coal carbonized; now in the new house, it costs 10·6d. per ton. There is here the justification for what has been done. The difference is emphasized when it is considered that in the new house 360 tons of coal are carbonized per twenty-four hours. The saving between 2s. 4d.



A Quiet Scene with Good Demand for Gas during Christmas Week.

and (say) 10½d. is 1s. 5½d. per ton; so that we have here a difference to the good between the carbonizing wages under the old and the new conditions of over £26 per day. Such a saving soon pays interest on the machinery; and there is besides the relief to the men from the exhausting and laborious work of scoop driving and hand drawing.

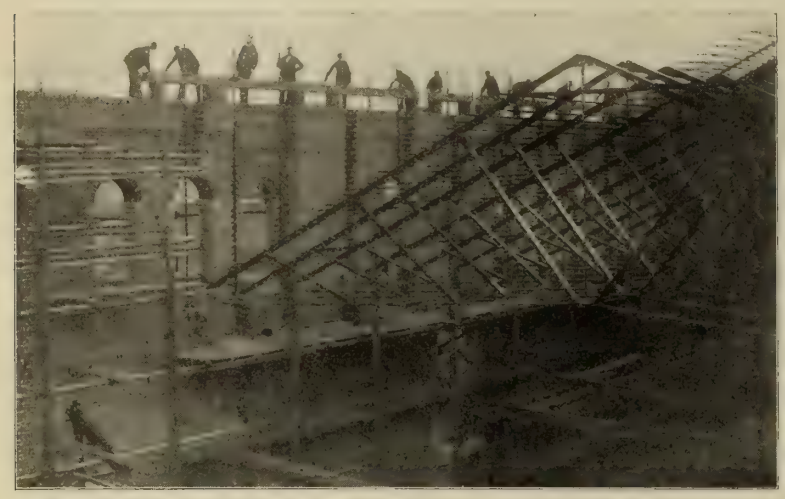
The Conversion of the Old House, and the Features of the Present One.

The house as it now stands is 324 feet long, 70 feet wide, and 40 feet high to the wall-plates; so that the old portion of the house had to be raised no less than 17 feet. The stage-floors are 10 ft. 10 in. from the ground-line. Of course, in order to accommodate regenerator furnaces, it was necessary to go either up or down. Underground floors, in the case of a retort-house, are objectionable in many ways. They are dark, difficult to ventilate, unpleasant for the men to work in, and costly to build, as the ground has to be excavated. For these reasons Mr. Shoubridge decided to build upwards to the height required, and to raise the roof of the old portion.

The raising of the roof was an interesting feature of the work. It was done in three sections of nine principals at a time, in the following manner: The walls were first built up to the required height along the entire length—chases being left in them to allow the principals to go up. When the walls were built, baulks of timber were placed along the top, so as to stand over the chases, and carry the bolts by which the roof was raised—nine principals, as previously stated, being raised simultaneously. The bolts were jointed together in 5-feet lengths—the top length being screwed, and fitted with a suitable nut. At the time of raising, a man was placed at each of the bolts with a spanner—eighteen men being so engaged. At a given signal, each man made, according to prearrangement, six to eight turns at a spell. Then there was a brief rest, and afterwards the operations were repeated until the men had lifted the section of the roof 5 feet. The brickwork was then built up underneath each principal; and when it was set, a length of bolt was taken out. The bolts were then coupled up again, and the operations were repeated until the full height of 17 feet was attained. The photographic illustrations will make the character of the work clear, with this description of the operations involved.

While referring to this work of raising the roof of the old portion of the house, it may be mentioned that the 124 feet of new roof required for the extension of the house was made by the Gas Company's own works' fitters, who also elevated the roof and finished it complete, including the slating. There is no need for a detailed description of the new portion of the roof; as we give a drawing of half a principal showing the dimensions of the members. It will be remarked that it is quite a simple structure, with an open ventilator along the top, after the manner of the first retort-house put up by Mr. Edward Drory at the Mariendorf (Berlin) works. The free vent for steam, dust, and smoke allowed by an open arrangement of this kind has a remarkable effect, aided by good ventilation from below, in maintaining clear conditions inside a retort-house.

This brings us to the brickwork. The design of the building is shown by the photographs. Here again, we have an example of the self-contained character of the South Suburban Gas Company's works. The bricks required for raising the old portion of the house, and for building the new part, the coal-breaker pits, &c.—bricks numbering over a million—as well as the stone for the sills and plinths, were all made by the Company's own men.



We have spoken of the excellent ventilation of the house; and anyone going into it must be struck by its lightness and airiness. Several things contribute to this desirable result. There is the great length of the house, the open ventilation at the top, and the numerous openings for access and egress at the ground-level and for light at the upper part. But there is another thing that tends to create a direct upward current throughout the house, and which could not be so well obtained under the usual circumstances. It is that the stage-floors do not extend the full width between the retort-bench and the house walls, so that there is a considerable opening left the whole length of the house on both sides. This contributes wonderfully to a clean, fresh atmosphere, and to the comfort of the men. Modern conditions of working enable this to be accomplished. There is now no drawing to be done, or other work than the opening and closing of lids, and the cleaning of the ascension-pipes. Under these circumstances, there is no necessity for wide stages. The stage-floors themselves are simple structures, being made up of steel girders, covered by ribbed cast-iron plates; the girders being carried at one end on the buckstays of the bench, and at the other end by cast-iron columns. Hand rails finish off the stages at the open side.

A Wide and Simple Retort-Bench.

If there is one thing more than another that strikes one about the engineering work at Lower Sydenham, it is the absence of elaboration, but pronounced practical reasoning for what is done. We are not referring to building design, but to equipment. Illustration is found in this bench. The bench consists of 26 beds of ten retorts each, built up in two tiers, five retorts high. The retorts are 22 inch by 16 inch, of ∩ section, and—this is particularly noteworthy—22 feet long. Each bed is heated by a regenerator furnace on the discharging side only. It was Mr. W. A. M'Intosh Valon, who, in the early days of the application of the principles of regeneration to retort-settings, preached the gospel of simplicity of construction meeting all the needs. The furnaces for the 26 settings of tens in this new retort-house are of Mr. Shoubridge's design; and we find he has eschewed those elaborate refinements of flues and so forth that are commonly met with in Continental practice. The regenerators are made with plain bricks and tiles; no special bricks being used in their construction. The simpler the construction of retort furnaces is, Mr. Shoubridge believes, the better; and the results attest solid foundation for the belief. Inspection gave complete satisfaction that regeneration was as efficient as it need be. The heats in the combustion chambers in every part of the bench examined were high and uniform; while the heat going away to the chimney was only sufficient to maintain the chimney draught.

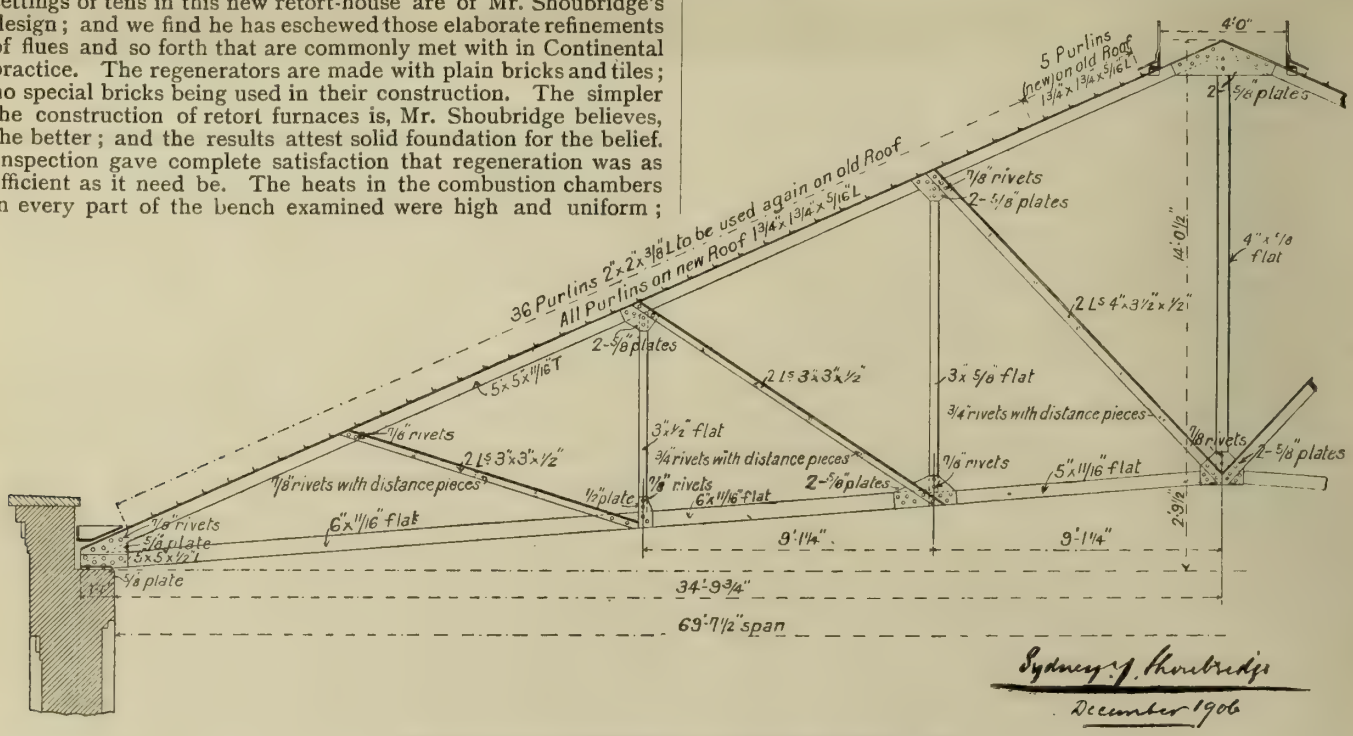
With regard to the bench-mountings, there is nothing special to say. It may, however, be mentioned that the hydraulic mains are arranged so that the tar is never allowed to accumulate in them; it being removed by the Dillamore system of tar-towers. The mains are in two-bed sections, with a separate tower to each section. The gas is taken from both ends of the retorts, through 6-inch ascension-pipes.

The Delivery of the Coal.

The coal is delivered by railway trucks into a hopper on either side of the house, whence it falls into coal-breakers below, capable of dealing with 30 tons of the hardest coal per hour. From the breakers the coal is elevated to two three-compartment hoppers, each of a capacity of 26 tons, on the charging side of the house; the conveyors being arranged so that they can be worked from either end—though one breaker and elevator is quite sufficient to supply the house. The breakers and elevators are driven by two of Messrs. William Grice and Sons' 34 brake horse power gas-engines, which also operate rams at either end of the breakers for upending the railway trucks, and tipping the coal. In passing, it is interesting to note that by this arrangement, the cost of delivery into the coal-receiving hopper, breaking, elevating, and depositing in the overhead hoppers has been reduced to less than ½d. per ton. The work formerly cost 2¼d. per ton. It should be mentioned that the coal is conveyed from the elevators to the



Views Showing the Method of Raising the Roof of the Old Portion of the House to the Higher Level.



Half of One of the Principals of the New Retort-House Roof.

overhead hoppers by De Brouwer conveyors. These conveyors can be worked, as desired, to deliver into either hopper.

The De Brouwer Projector and Discharging-Machine.

Pursuing investigations beyond the hoppers, we find a change from the common practice in the adoption of the De Brouwer projector. Originally, as is ordinarily the case, where this projector is applied, there was a measuring-chamber on the machine beneath the hopper; but this was found to be somewhat of a hindrance, and quite unnecessary. It must be remembered that the settings are five retorts high; and the difficulty was that, without allowing an undue height for the machine, it was impossible to get the capacity in the measuring-chamber with sufficiently vertical sides for the coal to fall out readily. It had to be a squat sort of chamber, from which the coal would not drop freely—especially when wet, when it had something more than a tendency to clog. In Mr. Shoubridge's opinion, it does not matter much whether the charges of coal are of uniform weight or a pound or two more or less. It does not affect the production of gas; and in practice very little variation is found in the quantity put in. It is remarkable how dexterous the men get in feeding the retorts, without automatic means of measurement, with the desired weight of charge. So far as the eye could judge, and we examined several charges in different parts of the bench, they looked as much alike in thickness as one ordinary brick does to another.

To get the most economical working in connection with the mechanical charging and discharging of retorts, the machines and men, of course, require to be fully employed. Here we have a house containing 260 retorts of 22 feet length each; the projector being supplied with coal from two isolated overhead hoppers. Under these conditions, one De Brouwer projector and one De Brouwer-Jenkins discharging-machine find just about as much work to do as they can comfortably accomplish. If the house were fitted with continuous hoppers, and the time saved in running to and from the hoppers, we have no doubt from what we saw that the machines and men could, without any trouble, deal with a few additional beds. However, the machines are here operating under eminently favourable conditions to show their capability. Both the projector and discharging-machines are of the latest type with which the names of De Brouwer and Jenkins are associated. They are supported in a framework mounted on a carriage running on rails laid on the stage on the charging side. The telescopic pusher works in a very leisurely way, and without any apparent effort. It does its work quietly and effectively. With it, there has been no buckling up of charges; it has not been found to fail in this respect in the slightest degree. The reason for this is that its designers have



Photographers—Messrs. Thomson, Sydenham Road, S.E.

View of the East Side of the Retort-Bench (Showing the Scurfing Platform) in the New House at the South Suburban Gas Company's Works.

fully appreciated the character of the work it has to do, and have constructed a machine, massive and substantial, and fully equal to any demand that may be made upon it. In this house, the machine, with these long retorts, has to deal with heavier charges than is customary; and it does its work, as we can testify, without the slightest difficulty.

Regarding the projector, it has been at work since July last; and a point of inquiry was as to the repairs required. Excepting the renewal of the belt, it has claimed no consideration in the nature of repairing. The first belt with which the machine was fitted—it was one with a raised rubber path in the centre—dealt with 13,510 tons of coal before it was worn out. The price of a new belt is £11 17s. 6d.; and the cost was therefore 0·21d., or rather less than a farthing per ton of coal. This is the principal part of the machine exposed to wear; and it cannot therefore be said that the cost of repairs is excessive. If retorts are charged with the simplest of tools known for the purpose—shovels or scoops—something has to be allowed for replacements; and then there is the incomputable quantity as to the wearing effect on the men. As there is only six months' working standing to the credit of the machines, it is too early to speak with any certainty as to the wear and tear. But from what has been seen, and taking into consideration the favourable conditions under which they are working, there is no reason to anticipate that they will not compare favourably with other forms of retort-house machinery in this respect. As to the work done by the projector. At the present time, it is putting in charges of about 8½ cwt.; and, looking where we liked in this long bench, it was found that the charges throughout the 22 feet length were "well and truly laid" in respect of levelness. Although in this regard they might be equalled, they could not be excelled, by other machine or inclined working.

The Coke-Handling Plant.

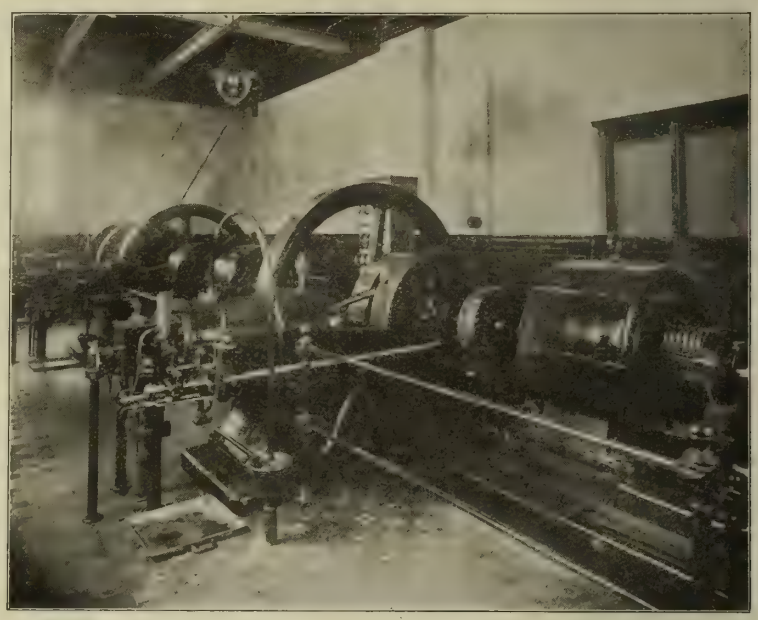
The coke is removed from the house by a De Brouwer conveyor, 2 ft. 6 in. wide, placed on the top of the stage-floor—that is to say, it stands to its full depth above the stage-floor. This is a totally different arrangement to the one seen in many new retort-houses, where the conveyor is taken into the cellar, and the coke made to travel underneath the floor. Mr. Shoubridge's view is that, by the usual system, there is a tendency for the steam to detrimentally affect the girders of the floor. To avoid this, and to make all parts of the conveyor more accessible, he has adopted this plan of fixing the conveyor on the top of the stage (with, of course, the return passing under the stage); and in this way it answers admirably. The pushed coke falls rapidly from the retorts, and in large size. Pushing and the mechanical handling of coke go remarkably well together. With the pushing of coke, there is a minimum of disintegration. The heavy charges come tumbling out of the retorts in what almost looks like a cart-load at a time; and it travels away silently and with the greatest of ease. The coke remains upon the conveyor where it



South End of the Retort-House, Showing the Engine-House and De Brouwer Coke-Conveyor.

falls and is taken to its destination without rolling or attention. The quantity of breeze is, therefore, reduced to the minimum. When it is remembered that the conveyor runs, in one stretch, the full length of this 324 feet long retort-house, and for 66 feet beyond, and that the charges of coke are exceptionally large, the smoothness and the quietness of its working are remarkable.

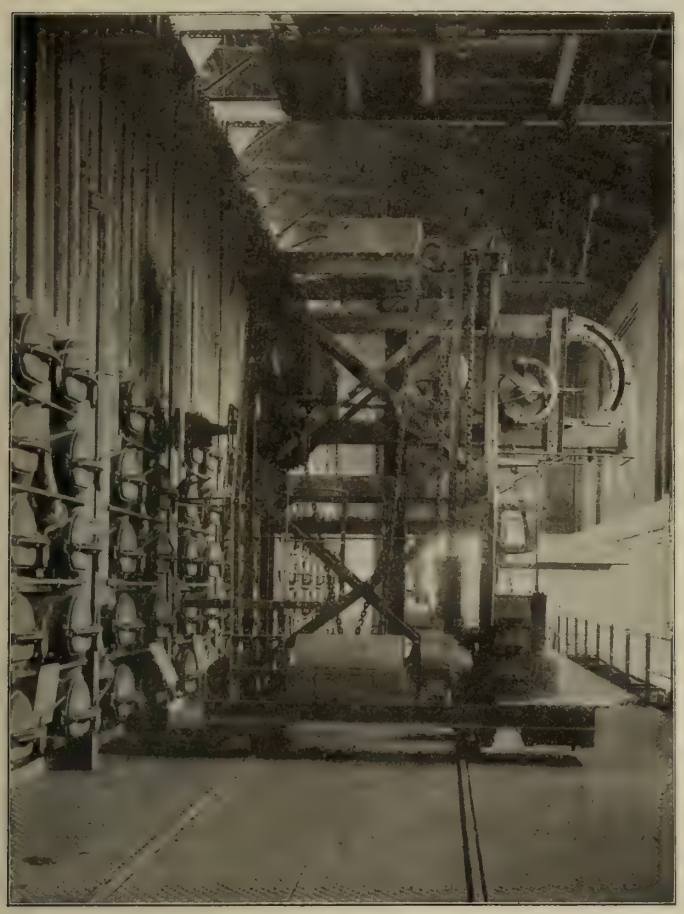
The huge heaps of coke are partly quenched in their transit through the house by jets of water playing upon them; and the quenching is completed at the end of the house, where the coke passes through water before ascending the inclined portion of the conveyor on the outside of the house. At the end of the conveyor incline, the coke is tipped on to a jigging-screen, which removes the breeze before delivering the coke on to the yard conveyor, which is 24 feet from the ground, and has openings on the under-side for distributing the coke on the coke-heap. The length of the conveyor in the retort-house is 315 feet from the centre to the foot of the inclined conveyor; the inclined conveyor is 66 feet long; and the yard conveyor 190 feet. As this last measurement indicates, the coke-ground is an extensive one; and it is indeed required, in view of the fact that here we have a house producing about 220 tons of coke per day. On either side of the heap, there is a railway siding; the bulk of the coke being loaded into trucks, and despatched by rail.



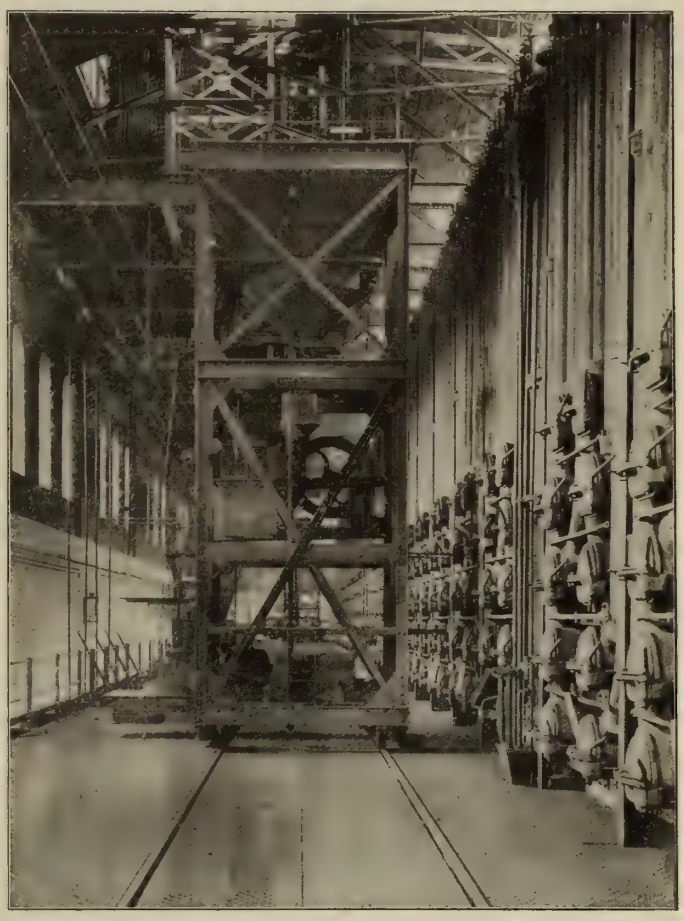
Interior of the Engine-House at the South End of the Retort-House.



View of the Retort-House End of the De Brouwer Coke-Conveyor.



The De Brouwer-Jenkins Pusher.



The De Brouwer Projector.

The Engine and Dynamo House.

The De Brouwer machinery is electrically driven. Accommodation for the engines and dynamos has been provided in a special building at the end of the retort-house, and there is interest in it. Good machinery that has important work to do deserves, where it can be obtained, proper habitation—for its preservation, and for securing from it its best work. Here the gas-engines and dynamos have got what is required. The building was constructed by the Company's men. It has a red-tiled floor; and glazed tiles are fitted all round the walls—green coloured for the dado and frieze, and cream-coloured between. The combination looks well. Besides saving the expense of re-painting or otherwise recolouring the walls, these tiles enable the man in charge to keep the place spick and span and to prevent the accumulation of dust—a condition which is so essential where there is fast-running machinery. The roof on its underside is boarded; and the windows are large, so that the place is well lighted by day. By night, high-power gas-lamps are in use. For an engine-house the building is well conceived, and its inspection gives pleasure. Such surroundings also give encouragement to the attendant to maintain the machinery under his charge bright and clean, and in the best running condition.

As to the contents of the house. There are three gas-engines (all of Grice's make); one of them being of 34 brake horse power for driving the coke-conveyor. The other two which are of 42 brake horse power are for driving the De Brouwer projector and discharging-machine. One is sufficient for the work; the other being kept in reserve. Flexible couplings connect these engines direct to two Lancashire dynamos, capable of developing 20 kilowatts, at 220 volts, when the engines are running at 230 revolutions. There is ample margin of power, as was shown by a test made when the projector and discharging-machine were fully at work. It was found that they required only 13 to 15 horse power to work them. The house, of course, is equipped with the necessary switch-board, with the voltmeters, ammeters, fuses, and cut-outs mounted on a handsome marble slab.

Returning for a moment to the gas-engines, it was noticed that, to one of the engines, in place of the usual flame igniter tube, an electrical igniter, actuated by a small battery and accumulator, has been fitted. We were informed that this improvement, devised and fitted by one of the engine drivers, not only causes the engine to work more smoothly and with less shock but that it effects an appreciable economy in the consumption of gas.

The Total Cost.

The total cost of the work we have described—comprising the conversion of a 200 feet by 70 feet wide house into one 324 feet long by 70 feet wide, with the raising of the walls and roof 17 feet in the case of the old portion, together with the complete equipment of the house with 26 regenerator settings of ten retorts each, with coal and coke handling plants (including the yard coke-distributing plant), and with De Brouwer charging and discharging machines—was £37,864. This is a very moderate sum; but it must be remembered that all the serviceable bricks from the old bench were used in the new bench, that the ordinary stock bricks and stone and the roof were made on the works, and that the Company's men did all the building and erection, with the exception of the plant supplied by Messrs. W. J. Jenkins and Co., Limited, who were the only contractors employed. The house is equal to producing 4 million cubic feet per diem, and is a very welcome addition to the manufacturing power of the works.

Whitewashed Walls and the Lighting of Schoolrooms.

A short note by Herr F. Uppenborn has been reprinted in the "Journal für Gasbeleuchtung" from the Proceedings of the "Vereinigung der Elektrizitätswerke," in which the author has described some measurements he made of the illumination in different positions in a schoolroom in Luisenstrasse, Munich, at a time when the walls and ceiling were soiled, and again immediately after they had been whitewashed. The schoolroom in question was a rectangular apartment, roughly 37 ft. 6 in. long, 26 feet wide, and 13 feet high. It was provided with indirect illumination from four electric lamps disposed symmetrically in the room; each lamp being approximately 9 feet distant from the short ends, and 6 ft. 6 in. from the long sides. The lights hung 3 ft. 4 in. below the ceiling. The ends and one side of the room were essentially plain whitewashed walls, and the other long side consisted almost entirely of windows. Measurements of the illumination were made in eighteen different positions, in three parallel rows of six positions each; the central row of observing positions coinciding with the major axis of the apartment, and the two side rows being vertically under the lamps. The figures have not been converted into British measurements, as interest in the matter is purely comparative.

	Before Whitewashing.	After Whitewashing.
Mean illumination	39·7 Lux	67·4 Lux
Maximum ,,	56·5 ,,	83·8 ,,
Minimum ,,	24·1 ,,	50·1 ,,
Maximum divergence from mean	−39·3 p. ct.	−25·7 p. ct.
	+42·3 ,,	+24·4 ,,
Ratio of mimimum to maximum illumination	0·43	0·60
Consumption of electricity, in watts per square metre per Lux	0·484	0·289

It will be seen that the average amount of illumination at the eighteen observing stations was increased by the fresh coat of whitewash from 39·7 to 67·4 Lux—*i.e.*, had risen by about 70 per cent.; also that the maximum divergence from the mean illumination had decreased from about 42 to about 26 per cent.

TESTS OF VARIOUS ILLUMINANTS IN VIENNA.

We recently received, through the Secretary of the Imperial Continental Gas Association (Mr. Robert W. Wilson), a most interesting comparative table as to different sources of light under the conditions of price, &c., prevailing in Vienna. It is a copy of one compiled last year by a Committee of the Austrian-Hungarian Society of Gas Engineers, with the exception that Mr. A. R. Egeler, the Association's Engineer at Vienna, has added to it the results he obtained with the "Graetzin" gas-lamp, which had not been tried by the Committee. The whole of the figures have been converted into English measurements on the basis stated at the foot of the table.

Writing to Mr. Wilson, in reference to the tables and the accompanying diagram, Mr. Egeler says: "The table shows the Hefner-Kerzen power of divers sources of light, which can be obtained in Vienna for one krone in one hour. The Graetzin lamp, however, was not included. We had it put upon the list and added to the diagram, with the gratifying result that it beats all the other lamps and burners."

Comparative Table of Different Sources of Light in 1906 under the Conditions of Price, &c., Prevailing in Vienna.

Source of Light.	Illuminating Power.		Hourly Consumption.		Heat Evolved per Hour. Large Calories.		Carbonic Acid Evolved per Hour. Cubic Feet.		Cost of Maintenance. Pence per Hour.		Light Obtainable for One Penny per Hour.
	Hefners.	Candles.	Total.	Per Candle.	Total	Per Candle.	Total.	Per Candle.	Total.	Per Candle.	Candles.
Candles—											
Wax	1·00	0·91	106·40	117·10 grains	65	71·50	0·39	0·431	0·414	0·455	2·2
Stearine	1·09	0·99	132·40	133·50 ,,	75	76·00	0·46	0·462	0·164	0·166	6·0
Paraffin	1·35	1·23	130·60	106·40 ,,	87	70·50	0·51	0·416	0·122	0·112	8·9
Composition — ⅔ Paraffin, ⅓ Stearine	1·23	1·12	131·70	117·70 ,,	81	72·50	0·49	0·443	0·144	0·128	7·8
Oil lamps—											
Rape oil, loose wick	0·80	0·73	117·50	161·70 ,,	72	99·00	0·40	0·555	0·073	0·1005	9·9
Moderator, purified oil	10·95	9·95	556·00	55·80 ,,	342	34·00	1·91	0·190	0·346	0·03475	37·9
Petroleum, circular burner	13·20	12·00	673·00	56·00 ,,	480	40·00	2·47	0·206	0·192	0·01595	62·7
Spirit lamp—											
With incandescent mantle	42·90	39·00	1991·00	51·10 ,,	698	18·00	4·20	0·107	0·553	0·01420	70·4
Gas—											
Batswing burner	20·00	18·20	9·39	0·517 cub. ft.	1,330	73·00	4·88	0·269	0·505	0·02780	35·9
Argand	20·00	18·20	7·06	0·388 ,,	1,000	55·00	3·67	0·202	0·380	0·02090	47·8
Regenerative	530·00	482·00	81·20	0·167 ,,	12,190	25·30	42·25	0·087	4·370	0·00902	111·0
Ordinary Welsbach	70·00	63·60	4·24	0·0664 ,,	600	9·50	2·23	0·035	0·228	0·00352	284·0
Lucas	411·00	374·00	22·25	0·0594 ,,	3,150	8·60	11·72	0·031	1·197	0·00319	313·2
Millennium (high pressure)	1060·00	964·00	42·40	0·0439 ,,	6,000	6·35	25·55	0·023	2·280	0·00231	433·0
Graetzin	110·00	100·00	3·18	0·0318 ,,	450	4·51	1·68	0·017	0·171	0·00165	584·5
Electricity—											
Edison lamp	34·60	31·45	104·00	3·31 watts.	90	2·86	0·00	..	0·728	0·02320	43·1
Osmium	31·40	28·55	48·70	1·70 ,,	42	1·47	0·00	..	0·341	0·01188	84·2
Tantalum	25·00	22·75	38·50	1·69 ,,	42	1·47	0·00	..	0·270	0·01188	84·2
Nernst	113·00	102·70	213·00	2·06 ,,	184	1·79	0·00	..	1·491	0·01452	68·8
Arc	400·00	364·00	440·00	1·21 ,,	380	1·04	0·38	0·00105	3·080	0·00847	118·0
Bremer (flame-arc)	1880·00	1710·00	440·00	0·257 ,,	380	0·22	0·74	0·00043	3·080	0·00176	568·0

The prices of illuminants in Vienna, on which the last three columns of the table are based, are as follows.

Candles.—Wax = 6·00 kronen per kilo. = 2s. 3½d. per lb.
Stearine = 1·92 ,, ,, = 0 8·7 ,,
Paraffin = 1·44 ,, ,, = 0 6½ ,,
Composition = 1·68 ,, ,, = 0 7·6 ,,
Petroleum.—Spec. gr. 0·815 = 0·36 ,, per litre = 1 4⅛ per gall.

Oil.—
Rape and moderator lamp = 0·96 krone per kilo. = 0s. 4½d. per lb.
Spirit.—Spec. gr. 0·840 = 0·36 krone per litre = 1 4⅛ per gall.
Coal gas.—19 heller per cubic metre = 4 5⅓ per 1000 c. ft.
Electricity.—7 ,, ,, hectowatt hour = 0 7 per B. of T.U.

Note.—In converting the foreign units of the original table into English units, the Austrian krone, or crown, of 100 heller has been taken as equal to 10d., and the Hefner as equal to $\frac{9}{11}$ English standard candle (see "Journal," Vol. XCV., p. 102).

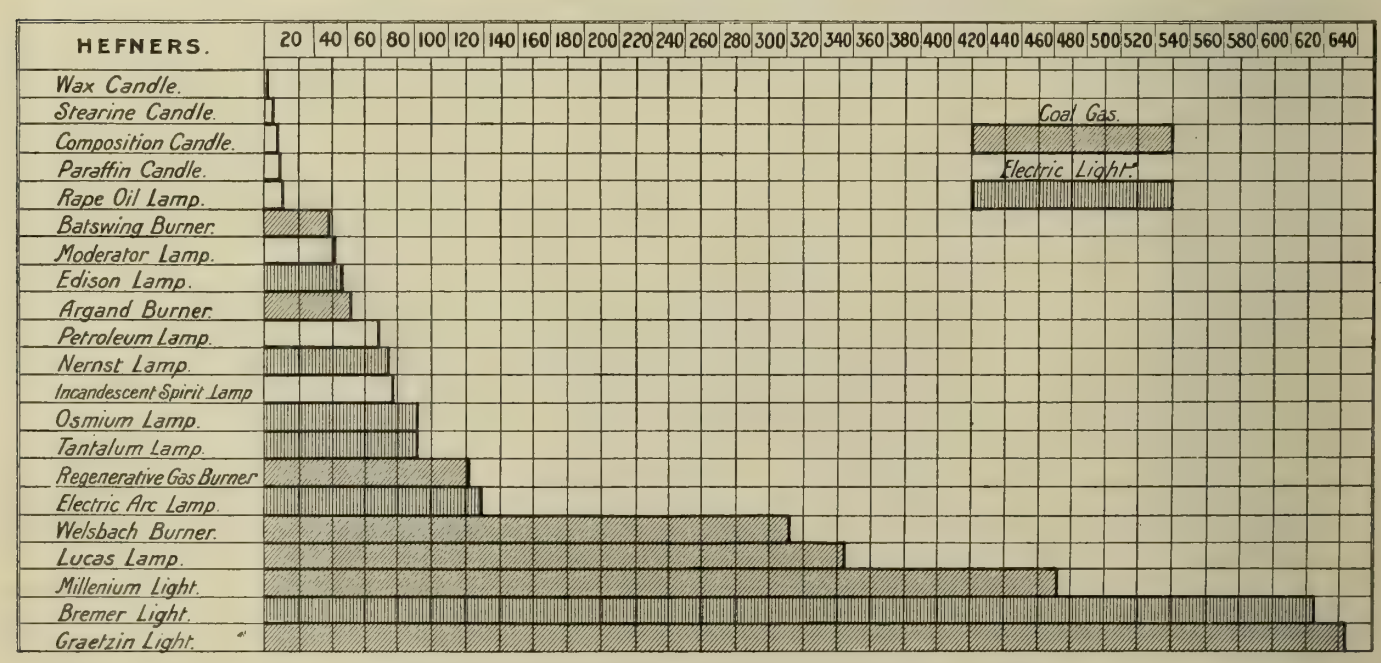


Diagram Showing the Light Obtainable for One Penny an Hour in Vienna.

The operation of the Philadelphia filters during 1905 cost on an average $4·13 per million gallons of water filtered, exclusive of that used in transporting and washing sand. The average cost per million gallons to scrape, transport, wash, and restore sand to the beds was 79 c. at the Lower Roxborough, 63 c. at the Upper Roxborough, and $1·25 at the Belmont station. The high cost at Belmont is due to the fact that the applied water carries more suspended matter. It receives an average of only 2½ days' sedimentation; while at Lower Roxborough it receives a day's sedimentation and is treated by preliminary filtration, and at Upper Roxborough about 15 days' sedimentation. The average amount of sand removed per million gallons of water filtered was 0·88 cubic yard at Lower Roxborough, 0·8 cubic yard at Upper Roxborough, and 1·57 cubic yards at Belmont.

CHURCH LIGHTING FROM THE CAMERA'S POINT OF VIEW.



St. Michael's Church Heavitree, Exeter, as Illuminated by "Nico" Inverted Gas-Burners.

How to properly light a church is a matter of great importance at the present day. The "dim religious light" of the past—which was regarded as correct, and tolerated not really so much because it befitted the sacred buildings and worship, but because the systems of lighting then existent were not by any means the best suited for dealing with the unfavourable conditions—is a thing that lives only in history. That the latter is the real reason for the past poor illumination of churches is clear from the fact that as soon as suitable means of lighting were provided, that converted the sombre (under imperfect lighting conditions) interiors of churches into places of brightness and beauty, they were, and are still being, in many cases eagerly taken advantage of by church authorities. The change is emblematic of the service the church itself renders to humanity.

Generally speaking, the architectural characteristics of churches do not offer any great facilities to the lighting engineer to get good and uniform illumination throughout the building. The high dark-stained wood lined and supported roofs do not aid reflection, and the shadow-casting pillars and arches down the naves, instead of being of assistance, are rather obstructive. Churches, however, are not built to fit the artificial lighting; the artificial lighting is a subsidiary matter, and must be arranged to fit the church. Therefore we have certain rigid conditions that have to be considered and dealt with in the best possible manner in any scheme of illumination. In the first place, the sight-straining light of olden days must be abolished. The primary object of lighting is to enable the worshippers to read none too convenient sized print; and therefore there must be uniform downward illumination without heavy shadows of any kind. Under these circumstances, lights of too great power must not be used; but they must be fairly frequently spaced and of medium illuminating powers. At the same time, the upper part of the church ought not to be lost in gloom. There are many churches whose upper architectural features are very beautiful, and though men and women do not, as a rule, attend church to study architectural design, there is no reason why that which is beautiful should be shut from their sight while engaged in worship. We have moved far from the puritanical belief in worship and beauty of surroundings being inconsistent. In securing such illumination, the inverted gas-burner is an admirable aid.

A great deal has just recently been said about the use of inverted gas-burners in churches; but it must not be supposed that, because of this, the application of such burners in the illumination of places of worship is something new. It is, as a matter of fact, quite three years ago that the burners of the New Inverted Incandescent Gas-Lamp Company, Limited, were applied to the purpose; and since then the work of installing them has been proceeding in many parts of the country. And this is worthy of remark, that during this very considerable experience there has been no complaint of trouble with the burners. In Bristol alone, there have certainly been at least two installations in churches going throughout the past two years; and the good reputation they quickly made for themselves has not diminished with time. Among the more recent introductions of the Company's latest forms of burners—the "Nico"—are those that have been made in Exeter churches; the installations having been carried out not by the New Inverted Company, but by the Exeter Gas Company. Here is reproduced a photograph of the interior of one of the churches, taken when the lamps were alight. We have heard a lot about "faked" photographs—even those who are not photographers will understand the "soft impeachment" that the word conveys. The photograph of St. Michael's Church, Exeter, has been carefully examined; and we are perfectly satisfied as to its *bona fides*. We should like to point out to those who are guilty of the art of "faking," that strong lights taken at a distance in large interiors do not show on the negative (according to our experience) a well-defined lamp, or (when a print is taken) a very white spot of light standing out with the definiteness of a star in the sky. On the negative the radiations from strong lights, if the photograph is properly taken, show as a cloud, which (when printed) is reproduced as something very much like a localized white mist. The church of St. Michael's is lighted by 30 No. 4 "Nico" burners, and 24 bijou ones. The latter are fixed on the pillars and side brackets in the sanctuary; and the former are used for the lighting of the choir and nave by brackets, as shown in the photograph. The vicar and churchwardens have expressed great satisfaction with the result; and this is not surprising even when judgment is based only on the photographic evidence. Look at the photograph, ignore the white mists, showing the location of the lights, and see what the surroundings tell of the character of the illumination. There is uniform lighting over the whole of the pews. The church is one containing beautiful architectural work; and the photograph disposes of the idea that with inverted gas lighting the beauties of the upper part of a large building are lost in darkness. The graceful lines of the arches, and the beautiful sculptural details of the masonry, are brought out with pronounced relief, and the altar is visible in every detail. The whole effect is evidence of really admirable arrangement and suitability.

The Exeter Gas Company have also fitted St. James' Church with inverted lamps. In this scheme, 86 No. 4 "Nico" burners and 24 of the bijou type are employed. Four of the pendants in this case are fitted with six burners each, to which auto-igniters are attached; the bye-passes being operated from a point near the meter. The Rector describes the lighting as excellent.

More convincing testimony than is afforded by these installations as to the applicability of the inverted gas-light to church illumination, and the satisfaction given to the church authorities, could not be obtained. The point of view of the camera also aids one to appreciate what is required and what to avoid in the lighting of such buildings.

INDOOR ILLUMINATION.

The November issue of the "Transactions" of the American Illuminating Engineering Society has recently come to hand, and contains some interesting matter for those more immediately concerned with the lighting of interiors. The report consists of two papers—one on the "Application of Photometric Data to Indoor Illumination," by Mr. E. C. White, of Winnipeg, and the other entitled "Data on Indoor Illumination," by Mr. J. E. Woodwell, of Washington—and includes the discussions which followed their presentation at meetings of the Society.

Mr. White, in introducing his subject, points out that the most important branch of illuminating engineering work lies in the application of photometric curves of lamps and their accessories to the requirements of practical illumination, but suggests that the ordinary polar diagram and the law of inverse squares are not merely clumsy for rapid work but liable to misleading results if used by persons not appreciating the actual phenomena which they represent. Curves of uniform illumination are advanced as the simplest device for graphical calculation yet provided for the application of distribution data to the design of illumination. These curves are simply polar diagrams representing the distances in all directions at which equal illumination is produced by the source for which the curve is plotted. Marginal scales are provided which read in feet for various intensities of illumination—that is, foot-candle values.

The object of the paper is to advocate the use of this system; and the author gives several diagrams of curves plotted for 16 and 32 candle power electric lamps, and incandescent gas-burners, both upright and inverted. The curves are shown on diagrams of concentric rings, all of which, counting from the centre, denote feet and fractions of feet; and by means of the scales, one can read off the distance at which varying foot-candle values are obtainable. Mr. White, in drawing attention to the advantages of equal illumination curves, remarks that their shape represents the effect produced, and not merely the cause; and that they afford instant reference to the best location of lights. An example of the use of the method is found in the illumination scheme of a dining-room; and this the author describes and illustrates.

In the second paper—"Data on Indoor Illumination"—Mr. Woodwell points out that illuminating engineering, having for its basis the physical laws of light which are subject to rigorous mathematical demonstration and calculation, depends nevertheless upon many other important factors tending to modify the application of fundamental principles and formulæ. It involves a study of the character, colour, and intensity of artificial illumination; the type, number, and position of radiants or light sources; kind of accessories; and, finally, the resultant optical, physiological, and æsthetic effects. The final criterion of satisfactory illumination is not a definite intensity as expressed in foot-candles, but a visual effect or physiological sensation incapable of quantitative expression.

Quantitative measurement of illumination is not therefore to be wholly relied upon as the basis for calculation. The paucity of data determined by actual illumination tests of every variety of indoor conditions makes it necessary to approximate general values for the intensity upon the basis of judgment and experience. It is known, for example, that one foot-candle is sufficient to enable one to read ordinary print (small pica) comfortably; while for newspaper print at least 2 foot-candles is desirable. For desk illumination, 2 foot-candles is generally sufficient; though for detail work 3 and even 4 foot-candles have not been found excessive. For corridors, public spaces, and assembly rooms, the figures range from 0·5 to 1·5 foot-candles; while in stores where dark goods are displayed or a brilliant effect is desired, 5 to 10 foot-candles is not uncommon. The latter amount is also required for tracing, drafting, engraving, and other similar work. These intensities refer to the working plane. Consideration must, in addition, be given to the walls and ceiling and objects in the space to be illuminated; and the figures determined upon for this purpose will depend principally upon the colour and reflection values of such surfaces.

Without discussing the choice of the illuminants themselves, the author then deals with such peculiarities or characteristics as affect their use. In order to ascertain what may be accomplished with a given light, it is necessary to know its distribution curve, including that of any requisite accessory.

The distribution is generally shown on a polar diagram, an example of which is given in the paper. Fig. 1 shows such a curve for an unshaded 16-candle power electric lamp, and also the distribution obtained from the same lamp by two prismatic shades. Such curves are of great value to the illuminating engineer; but unless the underlying principles are kept well in mind, deductions from a comparison of such curves for lamps and reflectors of different types are apt to be misleading to the layman.

To illustrate this point, let A (fig. 2) be a light source of the uniform intensity of 1 candle in all directions. Its curve of distribution in any given plane will obviously be shown by a circle; while the total flux of light from the source is represented by a sphere whose radius is 1 unit. Now if it is assumed that, by means of a reflector, the intensity throughout a zone generated by the arc B C subtended by the angle B A C of (say) 15° below the horizontal plane, is reduced one-half, the intensity over this area will remain one-half candle. If the flux of light borrowed from this zone is now re-directed vertically downward within the same angle of 15°, then the average intensity of the zone generated by the revolution of the arc D E about the vertical axis will be increased to

$$1 + \frac{\frac{1}{2} \times \text{area of zone generated by arc B C}}{\text{area of zone generated by the arc D E}} = 4{\cdot}83,$$ as shown graphically in Case II., fig. 2; the ratio of the areas of the two zones being approximately 1 to $7\frac{2}{3}$, as shown in Case I., fig. 2.

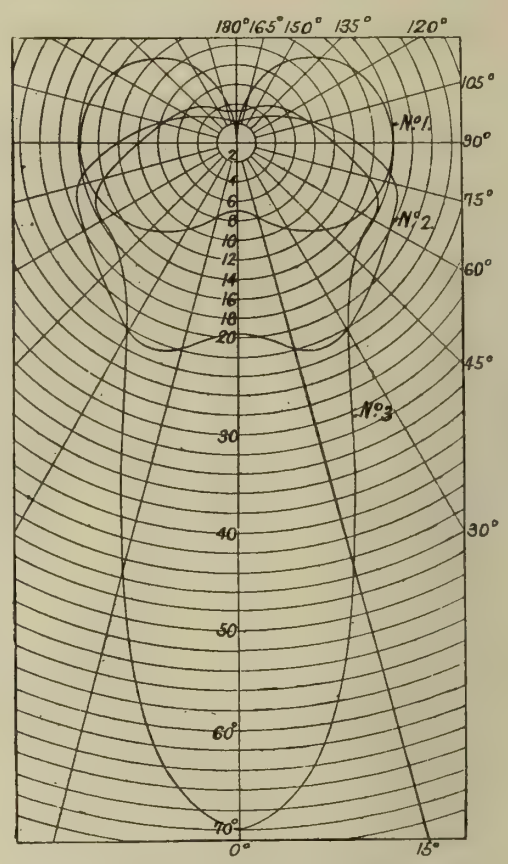


Fig. 1.—Curves of Candle-Power Distribution.

No. 1 Curve—16-candle power bare lamp. No. 2 Curve—Same lamp with distributing reflector. No. 3 Curve—Same lamp with concentrating reflector.

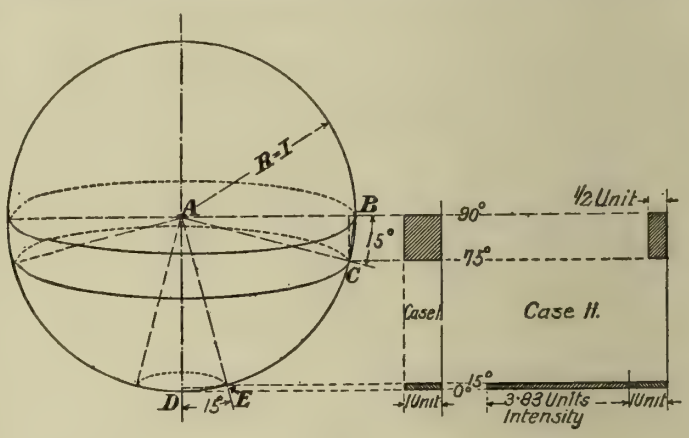


Fig. 2.

It is evident that a very small quantity of light borrowed at or near the horizontal may be made to enormously increase the intensity in the downward direction. The polar diagram which shows only the radial intensities does not, therefore, correctly indicate the change in flux of light at various angles. The prismatic shades giving the polar distribution as shown by Curves 2 and 3, fig. 1, for example, are of practically equal efficiency; but No. 2 appears to a decided disadvantage in the comparison. For general purposes, however, No. 2 would prove the most desirable and satisfactory reflector. To show this properly, recourse must be had to the Rousseau diagram, which is constructed as shown in figs. 2 and 3 on the theorem in solid geometry that the area of a zone is equal to its altitude multiplied by the circumference of a great circle. The surface of various zones, and consequently the illumination thereon, is thus proportioned to the respective altitudes; and if the altitudes of the zones included between the various angles are laid off by projection as shown in fig. 3, and the candle power at each radial line plotted thereon, the total illuminating power of a source of light will be proportional to the area enclosed by the Rousseau curve, and the flux of light through any zone will be correctly shown. The Rousseau diagram is essential to a proper comparison of the performance of various reflectors.

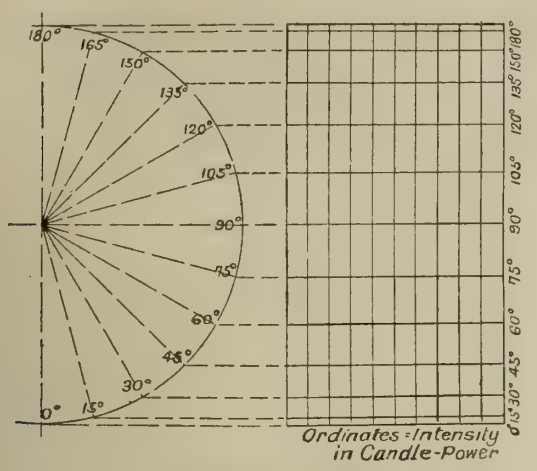


Fig. 3.—Rousseau Diagram.

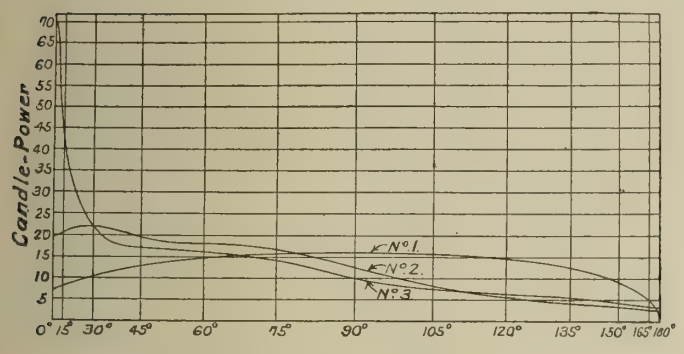


Fig. 4.—Rousseau Diagram.

No. 1 Curve—16-candle power bare lamp. No. 2 Curve—Same lamp with distributing reflector. No. 3 Curve—Same lamp with concentrating reflector.

Fig. 4 shows a Rousseau diagram of the bare 16-candle power oval anchored, carbon filament lamp, and the same lamp with the two prismatic reflectors which are comparable with the polar diagrams shown in fig. 1. Here the volume or flux of light below the horizontal or between 0° and 90°, as represented by the area below the curve, is clearly shown to be about the same for Reflector No. 2 as for Reflector No. 3. The effect of both reflectors in redirecting the light of a bare incandescent lamp from the upper to the lower hemisphere is also clearly shown. The difference between the area below the curve of the reflector and that of the bare lamp should properly show the absorption of light in the material of the reflector, and any other losses; this being a measure of the efficiency of the shade.

The author next proceeds to describe the usual method of determinating the quantity of light falling upon a given surface by the law of inverse squares, expressing the illumination in foot-candles. The use of Lambert's cosine law is also shown for cases where light rays strike the plane at an angle. The computation of the value of the lighting effect in foot-candles is illustrated by an illumination curve of a 32-candle power Tantalum lamp and prismatic shade located 5 feet above the horizontal plane to be illuminated. Mr. Woodwell remarks that the law of inverse squares does not hold for light sources of appreciable size, such as the Moore tube and the Cooper-Hewitt lamp; the actual deviations being considerable even in the cases where large diffusing globes are used.

The radiation from a cylindrical source has been investigated by Dr. E. P. Hyde, of the United States Bureau of Standards, in connection with the use of a Nernst glower as a light source in certain photometric tests showing the necessity in refined work of taking into account such errors as are likely to occur from a deviation from the law of inverse squares. The radiation from a cylinder of infinite length varies in intensity inversely as the distance from the axis of the cylinder; and in practice this law is approached in the application of the Moore tube. The Cooper-Hewitt lamp is far from a point source; but at distances long compared to the length of tube its radiation approaches the law of inverse squares, while at comparatively short distances it is nearly proportional to the distance.

In the foregoing, no account has been taken of the effect of the reflection. Illumination is frequently very materially increased by diffused reflection from walls and ceiling; the amount being dependent upon the distance of the light source from the reflecting surface and the coefficient of reflection. The increase in illumination due to reflection is small in the case of dark walls or large rooms; but with small interiors having white painted or similar walls and ceiling, the direct illumination may be increased two or even three times. The theoretical constant is computed by the formula $K = \frac{1}{1 - C}$, where C = coefficient of reflection of the walls or surfaces. For relatively large interiors and light-tinted walls and ceilings, the values of $\frac{1}{1 - C}$ will be found to lie generally between 1·25 and 1·50. In planning a system of illumination for a new building on which the colour scheme is not determined, very little allowance can safely be made for reflection; but where, with a view to economy, the finish of walls and ceilings is planned to take advantage of reflection, the resultant illumination may by this means be more than doubled.

Mr. Woodwell next deals with the important question of the intrinsic brilliancy of the light source. With recent developments in arc and incandescent lighting has come a corresponding increase in intrinsic brilliancy, so that it is necessary either to shade such lights or to keep them entirely out of the field of vision. The physiological effect of a light source of high intrinsic brilliancy within the field of vision is to so reduce the pupillary aperture that the normal sensibility of the eye is greatly impaired. The author furnishes the following table of the intrinsic brilliancy in candle power per square inch of a number of common light sources:—

Moore tube	¼ to 1½
Gas arc lamp	1 to 2—alabaster globe
Candle	3 to 4
Cooper-Hewitt lamp	3 to 6—approximate
Incandescent, frosted	2 to 8—dependent upon efficiency and style of build
Kerosene oil lamp	3 to 8
Gas-mantle burner	20 to 25—unshaded
Acetylene flame	75 to 120
Enclosed arc	100 to 200
Incandescent lamp	100 to 300—bare
Nernst lamp	800 to 1000—bare

As a brilliancy in excess of 5 or 6 candle power per square inch produces retinal fatigue and irritation, it will be seen that the most common illuminants require shades or enclosing globes if placed within the field of vision. Even where illuminants of great brilliancy are located out of the field of vision, care must be taken to avoid regular reflection from objects to the eye, as light of comparatively low intensity entering the eye at an unusual angle is quite as detrimental as excessive brilliancy in the direct line of vision.

The author devotes the remainder of his contribution to practical work, giving descriptions of several illumination schemes carried out by himself and others in the States, in which regard has been paid to the fundamental principles of illumination dealt with in his paper. In the case of the class and lecture room of the Y.M.C.A. building, Washington, between 2 and 3 foot-candles illumination was provided on a horizontal plane 30 inches above floor level. No allowance was made for reflection, in consequence of the existence of blackboards on one side of the room and the uncertain colour value of the walls. The number and position of light sources were arranged so as to avoid shadows and to obtain uniform illumination over the working area. The diagram submitted by him shows two excellent foot-candle curves superimposed transversely and diagonally over a plan of the room.

Incidentally, in describing and criticizing various other schemes (which, because of their local character, it is here unnecessary to detail), the author refers to the four-light gas arc lamp as being successful for general illumination by reason of its low intrinsic brilliancy. The efficiency of a four-light gas arc lamp with reference to its total flux of light has been shown by test to be less than that of four individual incandescent burners, due to the interference of light from the group of four burners in the arc. The inverted burner is particularly efficient and satisfactory for postal and other work-room illumination, since a large proportion of light falls below the horizontal—67 per cent., compared with 45 per cent. of the upright incandescent gas-burner. In concluding, the author suggests that the subject is too comprehensive to be dealt with in a single paper.

The discussions which followed the reading of the two papers at the several sectional meetings were in part devoted to the various examples of actual illumination schemes executed or referred to by the authors; but the purely technical portion is briefly abstracted as follows.

At the New York Section, Dr. A. H. Elliott emphasized the great importance of the distribution of light as compared with its intensity. He suggested that pure plaster of paris, which reflected 80 per cent. of the light, would serve as a good distributing agent if the light rays were allowed to strike upon its surface, and that this would be preferable to having an intense light which has to be toned to the extent of 15 to 50 per cent. by glass. Dr. C. H. Sharp stated that it is not sufficient in all cases to consider the illumination on the horizontal plane in a room. The horizontal rays illuminating the vertical and also illumination on the normal plane, as in the case of reading, have to be taken into account.

At the New England Section, Dr. Louis Bell, in referring to Mr. White's curves of equal illumination, stated that he personally finds the ordinary polar diagram and slide-rule a very convenient combination for measuring illuminating effects, but that some people might think the curves described were easier of application. The speaker also calls attention to the undue importance attached in Mr. Woodwell's paper to the law of cosines, and pointed out that nearly all the light used in reading or for ordinary purposes is normal in character—the book or paper being generally so placed that very little oblique light is utilized. The same thing applies to outdoor work; street lighting is concerned more particularly with objects projecting from the surface where normal illumination is of value. In dealing with the question of the illumination of a room by a number of lights, Dr. Bell says there is no satisfaction in trying to make a deliberate and complete

integration of their lighting effect; and it is easier to calculate the illumination from the nearer lights and neglect that from the distant ones, since some of the latter cannot simultaneously fall upon the work, and others may be cut off. The speaker later on remarked that in the Rousseau diagram the principal thing is merely to give a diagram of areas which represent quantities of light thrown out in different zones. It is very valuable for one special purpose—and that is for furnishing a quick way of integrating the total flux in various directions. As the polar diagram is as easy to make and equally easy to figure from, it is entirely adequate, and will continue to be the one in general use. The Rousseau can be directly derived from the polar diagram, should it be necessary to show the absorption by a given shade, and thus get at the actual loss of light.

THE NESTLER GAS-FINDER.

In a recent number of the "Journal für Gasbeleuchtung," Herr T. Hahn, of Kötzschenbroda, describes the apparatus constructed by Herr C. Nestler, of Lahr, in Baden, for locating a leak in underground gas-mains, and also some improvements he has made in the apparatus, with the object of rendering it even more trustworthy and sensitive.

The Nestler gas-finder consists of a portable upright stand carrying a suction pump worked by hand, with the aid of which a current of air, or air and gas (if there is a leak), is aspirated through flexible tubing from a standpipe inserted in a hole previously made in the ground in the neighbourhood of the spot where leakage is suspected. On its way to the pump, the air is forced through two small filters to extract dust or sand. From the pump the air travels through a tube, which is constructed of glass, so arranged that a piece of filter-paper moistened with palladium chloride is exposed to its action. Afterwards the air passes to a rubber bag and also to a burner, where the presence of gas in the air aspirated can be detected by applying a light. The lower part of the pipe that descends into the ground is perforated, and it is made tight at the surface of the soil with a suitable plug of damp clay. The instructions given with the apparatus are that the filter-paper shall be treated with a 10 per cent. solution of palladium chloride by means of a spraying apparatus.

The first experiments carried out by Herr Hahn with the Nestler gas-finder were entirely unsatisfactory—the paper prepared in the prescribed manner failing to show the presence of gas; but he has found that perfectly good results can be obtained if the apparatus is modified as follows: The pipe leading from the pump is made to point in a downward direction, terminating about half-an-inch above a small level table fixed to the upright stand. On this table a piece of white paper, measuring about 3 in. by 2 in., is laid, being held in position by a 1-inch ring of glass, which can be momentarily lifted when necessary, and which also prevents the gas issuing from the tube being blown away by the wind. The operator carries in his pocket a corked bottle of palladium chloride solution. He inverts the bottle, and applies to the centre of the piece of paper the drop of liquid clinging to the cork. When the pump is worked, the current of air is thus brought into intimate contact with the reagent in a liquid state, and discoloration then occurs instantaneously if gas is escaping from the main under test. The whole operation only takes a few seconds, and 100 grammes of the palladium solution will last for a year. When the used papers have accumulated sufficiently, the palladium in them can easily be recovered.

From Non-Statutory to Statutory Condition.

We learn that a guarantee fund has been formed by several gas companies in order to test the claim of the Inland Revenue Commissioners for stamp duty when a limited company obtains parliamentary powers, and the property is vested in the statutory company, and that the case will shortly come before the Courts. Messrs. Batten, Proffitt, and Scott, of No. 32, Great George Street, S.W., are Solicitors for the interested companies; and they have retained as Counsel Mr. C. A. Cripps, K.C. Mr. F. Paternoster, of the Felixstowe Gas Company, has been indefatigable in promoting this matter; and from him any information can be obtained by interested companies.

Distinctions Conferred upon German Gas Men.

In connection with the opening ceremony of the new German Museum at Munich, on Nov. 13, the German Emperor conferred a number of distinctions upon scientific and technical men who had taken an active part in its equipment. Among those honoured in respect of the gas and lighting sections may be mentioned Dr. A. Slaby, of Charlottenburg, on whom the Order of St. Michael in the second class, with star, was conferred; Dr. W. von Oechelhaeuser, of Dessau, and Professor H. Rietschel, of Berlin, both of whom received the distinction of the Order of St. Michael in the second class. The same Order in the third class was conferred upon Dr. Wilhelm von Siemens, of Berlin, Herr P. Langen, of the Deutz Gas-Engine Works, Dr. T. Peters, of Berlin, and Herr R. Diesel, of Munich.

AN AMERICAN MUNICIPAL GAS PLANT.

At the last Annual Meeting of the Pacific Coast Gas Association, a paper was read by Mr. C. E. Moore, in which he gave the following account of his personal experiences with the municipal gas plant in the town of Santa Clara, in California. As this is the only municipal plant, so far as the writer was aware, on the Pacific coast, his story is of special interest.

There is nothing remarkable about this plant, except the fact that it is owned and operated by the Municipality. The writer has for several years been acting as Consulting Engineer for the town, and in this capacity had charge of the construction of the water and electric lighting plants which preceded the gas plant. When gas was taken up, it naturally followed that the same arrangement was continued. It will therefore be understood that the Engineer as well as the Municipal Council had much of the gas business to learn. However, having been identified with the enterprise since its establishment, and continuing at present to be in touch with it, and since the plant occupies rather a unique position, it has seemed that a brief account of its career may be of interest. The account will naturally fall somewhat into the line of a discussion of municipal ownership; but this will not be with the object of establishing any extreme views, but rather with the idea of drawing such inferences as are possible from our experience. Regarding the broader question of general municipal ownership, the writer has come in contact with it in many other places, and inevitably his views are somewhat coloured by the sum-total of all this experience; but the effort will be made here to confine deductions as strictly as possible to those following from this case.

To make the situation clear, it will be necessary to first state, in a brief way, the causes which led up to this particular municipal ownership. Twelve years ago, the town of Santa Clara took up the ownership of water supply. For this there were several powerful reasons; the chief one, perhaps, being the necessity for better protection from fire. This plant was successful from the start. There was also a desire for a more extended system of street lighting; and it seemed advisable to take it up in connection with the water-supply plant. It was installed ten years ago. This also was satisfactory, and people came to have considerable pride in the plants. Every town, like an individual, is pleased to have something to talk about; and the municipal plants came to be the thing to talk about in Santa Clara.

The matter now passed beyond the case of necessity; and the later movements have been largely the result of the impetus of the idea. Municipal ownership became a specialty. Commercial lighting was taken up by buying out the property of the Electric Light Company, remodelling and extending the system, and combining it with the street lighting. Current for the purpose was formerly generated by the town; but for several years it has been bought from the San Jose Light and Power Company, and it is supplied by the standard long-distance transmission lines. Gas was supplied by the San Jose Gas Company (later the Light and Power Company) for years by a pipe-line from their works.

The condition of the town had been such that there had been little encouragement for the Company to extend their lines. There had been no special effort to push the business, and the consumption was only 10,000 cubic feet per day. However, with the coming of renewed life to the town, there began to be felt a desire for more extended service. Chiefly, the development of the gas plant may be considered as due to the idea which had taken root. There was no particular dissatisfaction with the Company, and the movement was entirely devoid of enmity to it. Accordingly all the property of the Company in the town was purchased at a valuation made by an expert agreed upon by both parties. The transaction was amicable and satisfactory throughout.

There has since been considerable increase in the consumption of gas (chiefly for fuel purposes), and the output is at present 35,000 cubic feet per day. The price was at first fixed at $1·75 per 1000 cubic feet; this being the figure then charged by the Company. Afterwards, for service in San Jose, the Company put the rate at $1·50; but no reduction was then made by the town. Still later the Company reduced the rate to $1·25, and the Municipality followed with a reduction to $1·50; and they are now selling at this rate. That is to say, the town has, in the matter of rates, pursued a conservative course, and has made no reduction until virtually forced to do so by the Company. Of course, there is no actual competition between the two; but inasmuch as they serve adjoining territory, it is in practice difficult to maintain a much higher rate in one than in the other.

It will, perhaps, be apparent from the foregoing that an attempt has been made to manage the plant on business principles, and not to be carried away by any popular idea that something could be had for nothing. About 20,000 feet of pipe was taken over from the Company, and since that time about 50,000 feet have been laid. It has been necessary to do this work largely with unskilled labour. At the beginning, the work done in remodelling the distributing system was from necessity advertised. The contractor who undertook the work was not accustomed to laying gas-pipe. The blocks in many cases have very little fall—barely enough for surface drainage. Under these circumstances, the writer put in practice a system of laying to grades previously established by levels; and it has been followed ever since. This is done with so little trouble, and with such good results from

entirely unskilled labour in grading the trenches, that it would seem good policy for any company working in a flat country to follow the same system. In the old pipes, laid in the ordinary way with a spirit-level, there have been frequent traps and stoppages; whereas in the new mains there have not been any. The number of drips is also kept at a minimum, and these are located at convenient points; and where they will do the most good. The particular methods employed had previously been developed for use on sewer work.

Now a few words as to the conclusions from our experience. First of all, the plant and business need continual and watchful care. This is, of course, an entirely unnecessary thing to say to men of experience; but it is a fact that is not fully appreciated by others. In our case, the care has been provided; consequently the business has been successful. It has been very fortunate that there were few changes of officials. The office of President of the Board (or Mayor) has not changed during all this time. The Chairman of the Water and Light Committee also has from the first been identified with the management. Questions of policy have been given as careful consideration by them as though the business had been their own. The result has been a good profit; but it is very easy to see that the balance might have been the other way. This is the chief danger that confronts any scheme of municipal ownership—namely, that men of ability may not be willing to give their attention to the business of the town, or that the people will not have the good sense to keep men of this kind at the head of affairs.

Next as to the ability to meet emergencies. We have recently had an experience of this kind growing out of the partial wrecking of all the plants by the earthquake. This rests upon the men, and not upon the system, and consequently goes back to the first question of management. In our case, we feel no cause for regret, inasmuch as water was supplied in about 24 hours and gas in three days. With regard to the ability to provide extensions, the municipality is decidedly at a disadvantage. Whereas a company can borrow money to meet a large increase in the demands upon it, a municipality cannot do this except by a bond issue, which cannot be resorted to in all cases. Consequently, it is necessary to look well ahead, and provide far in advance for such extensions of magnitude as are likely to be necessary.

As to the attitude of customers. Here we are dealing not only with gas, but with human nature; and this is practically the same the world over. There is an occasional demand for lower rates, in the case of the town, as there would be with a company. There is the same distrust of meters. About half the consumers consider the collector and meter reader their natural enemy. The people's pride in the plant is chiefly in the abstract, and does not particularly affect their attitude toward bills and service. And yet it is not quite fair to leave the question at this; for there is a certain amount of feeling of individual ownership, which probably makes the conduct of these matters a trifle smoother than in ordinary cases.

The conviction of the writer is that a municipality should hardly be advised to undertake the management of plants solely for the sake of profit, as an individual or a company may do. There should generally be other and stronger reasons. In the case of water, there often are such reasons. As we leave water supply and look along the line of other utilities, we find that these causes usually have less force. This does not mean that gas should be supplied at cost. In the first place, in a developing community, extensions and increased facilities in every way will probably be called for. If gas is supplied at cost, all this must either be provided for in the first bond issue (which, on account of its uncertainty, is not practicable), or else by taxation later. Secondly, the question of exact cost is a precarious one at best. It must include all unexpected and emergency expenses, and can really be determined only after a term of years. The probability is that selling gas at cost, as determined from ordinary running expenses, would finally result in the plant requiring support from other funds of the town.

To condense all this, I would say that a municipality, like an individual, should act with judgment and upon competent advice, and not be carried away by impulse in either direction. This is, perhaps, a condition which cannot be fully realized; but in this, as in other affairs of life, it is well to have an ideal.

In the course of the discussion on the paper, Mr. Berkley said the first thing that struck him was that the Municipality of Santa Clara were selling gas for $1·50 per 1000 cubic feet. This, however, did not exactly meet the demands of municipal ownership; but, as the author had rightly said at the close of his paper, they could not afford to sell at a lower figure because of conditions overlooked by ordinary individuals when they were talking about municipal ownership. He knew that in the Middle States, where this ownership had been agitated, the claims were made that people must have gas at cost price. To the ordinary layman, this statement meant something; but it did not mean anything except financial failure. He thought the author was really entitled to a great deal of credit, for while he gave the price, he also stated that gas could not be sold at its cost. They were working at some profit; but, of course, he did not say how much it was. As the Mayor had acted in the same capacity for ten years or more, they could hardly consider this case was a fair test of municipal ownership, because the work had been under the control of the same people so long. Ordinarily municipal authorities were changed, and new men brought into office; but here credit must be given to them for continued service.

Mr. Britton said he had for the past 25 years been a strenuous opponent of municipal ownership, and had written volumes in attempting to show up the fallacies of the reports which were made by municipalities to cover their costs, particularly in the case of electric light plants. If all the municipal owners of plants in California would be as frank, honest, and fair as those at Santa Clara, the public would have nothing to fear. The want of success was due primarily to the lack of management, government, and knowledge. In all municipally-owned plants in California, a man seldom held his position, even as engineer, for a longer term than that of his friends in the Council or Trust, and there was consequently no incentive to work. It had been the habit of all these towns to hide actual expenses—to avoid the question of the cost of operation of one utility by charging interest to another. He did not think that in California they need have any fear of a great stride in municipal ownership, if companies in the State would study their own interests. The policy of gas and electric light men was broadening every day, not only in the reduction of rates, but also in their line of duty to the municipality.

In replying upon the discussion, Mr. Moore said, with regard to the profit made, he had with him copies of the Town Clerk's statement for the present year, and members were perfectly welcome to the information it furnished. The fact that three plants were working together was one element of economy; and another was the officers having been unchanged for the entire period of ten years. There were exceptionally able men at the head of the Board. He had pointed out in his paper that a business was practically the same, whether conducted by a municipality or by a private company; the same difficulties had to be met, and people would not be satisfied. They wanted in all cases to get a good deal for their money. He agreed with Mr. Britton that a reaction was taking place in regard to municipal ownership, particularly in respect of electric lighting plants. In answer to a question as to how he arranged for the renewal and extension of his plant, Mr. Moore said all the money collected was put into the general fund, and this had so far been sufficient to provide for extensions. Nothing was charged for depreciation; but he thought this should be done.

Mr. Lowe (who was in the chair) said he was familiar with the situation at Santa Clara, and could state that the working of the municipal plant there was very much the same as though it was in the hands of private owners. Business men were in charge of it, and they conducted the gas, water, and electric light concerns as if they were their own. They recognized that it was unfair to privately-owned companies to claim results which they had not achieved in practice; and they had published their statements fully and fairly. It was the only instance within his knowledge where a municipality had stated the case exactly as it existed. He added that it was not often that gas men were able to welcome a municipal man to their meetings; and therefore their thanks were due to Mr. Moore for his paper.

The Notification of the Gas Referees for 1907.

The Notification of the Metropolitan Gas Referees for the present year was published yesterday. It differs in only a few respects from the document issued in August last, which was a reprint, embodying alterations (duly notified in our columns at the time), of the thoroughly revised Notification which appeared at the opening of the year. The principal changes in the instructions now under notice consist in the inclusion of certain passages from the London Gas Act, 1905, which will make the Notification more self-explanatory. For instance, in the section dealing with the times and mode of testing for illuminating power (p. 7), a paragraph is inserted specifying that the gas supplied by the Gaslight and Coke Company is required to have an illuminating power of 16 candles, while that of the South Metropolitan and Commercial Companies is only of 14-candle power. In the section in which the Referees prescribe the times and mode of testing for sulphuretted hydrogen (p. 9), they give the provision from section 6 of the Act, setting forth that the gas supplied shall not exhibit any trace of sulphuretted hydrogen when tested in a mode to be from time to time prescribed and certified by them, which mode is not to be more stringent than that prescribed in Schedule A of the Gas-Works Clauses Act, 1871. In Appendix O, the form in which returns are to be made has been altered so as to include the time of making the test.

The Astoria Gas-Works, New York.—In the last number of the "JOURNAL," we reported the starting of a section of the new works which are being erected by the Consolidated Gas Company at Astoria, New York. The retort-house brought into use for the first time on the 3rd ult., by the charging, by the Company's Chief Engineer (Mr. W. H. Bradley), of the first inclined retorts, was put up by Messrs. Bartlett, Hayward, and Co., and contains 64 settings of nines. Another portion of the works—the 15 million cubic feet gasholder, the construction of the tank for which was illustrated in the "JOURNAL" for Jan. 9 last year—is making good progress; and it is expected to be ready by next June. Meanwhile, as already mentioned, the gas made in the new retort-house will be pumped to the Ravenswood works at Long Island City, and sent thence by the East River tunnel to New York.

VARIATIONS IN CONSUMERS' METERS.

By J. M. Rusby, of Philadelphia.

[A Paper read before the American Gas Institute.]

In the following paper is presented some information concerning the causes of erroneous registration and proof of dry gas-meters through decay and "bleaching" or hardening of leather diaphragms and other actions. Though the topics discussed are few in number, it is believed they cover some serious causes of meter registration troubles. The information furnished has been derived from working experience, and also from rather extensive special investigation and experiment by the Company with which the writer is connected;* and it will be presented under various headings.

Diaphragm Decay.

Where diaphragms are of such size, or so mounted, that they continuously or frequently in their motion come in contact with any portion of the metal of the case, injury is almost certain to follow. In our experience, a great number of meters which have become "non-register" or seriously slow, have revealed upon examination diaphragms ruined through this cause. The coating of tin is found to be removed from the sheet iron of the case at the point of contact, and corrosion is in progress. In many cases, the particles of iron compound will be found to have impregnated the leather to very visible extent. The leather is entirely rotten at this point, the particles of iron probably having contributed to this effect. In a great number of cases, the leather remote from these points of contact will be found thoroughly sound, and still capable of years of wear. Furthermore, an examination of the meter-case metal at the point of contact reveals that the product of the corrosion of the iron stands out from the surface in small and sharp projections, which quickly rasp the leather entirely through. The precise cause of this action between the metal and leather we are unable to state. In either purchasing meters or equipping them with new diaphragms, we therefore now have the latter of such size, and so attached, that this contact with the case is entirely avoided. It is already the common custom of makers, I believe, to insert a leather ring between the diaphragm leather and the metal rings to which they are attached. Attention was called to this danger from metal and leather contact by Mr. B. H. Spangenberg in a paper read at the 1904 meeting of the American Gaslight Association.† Meter diaphragms were formerly—indeed, they may to some extent still be—attached to their rings by means of wire winding. It has been our experience that wire for this purpose is inferior to cord. An action probably somewhat similar to the foregoing appears to take place between the wire and the leather, and many cases of breakage of the diaphragm at this point have resulted.

As to the deteriorating effect upon the leather of the various sulphur compounds and other impurities in gas, it seems certain that any one of them will have such effect if existing in considerable percentage. Ammonia is one of the worst. Diaphragm leather dipped into ammonia solution is very quickly reduced to a gluey condition, and on subsequent drying is as brittle as paper. The same general tendency exists with gaseous ammonia. The small quantities of these constituents existing in a properly purified gas have, however, a very slow action indeed, as is shown by the long life of properly mounted diaphragms passing a gas of good quality.

We can find little literature upon this subject. There has been some discussion of it by German gas engineers,‡ and as the result of their experiment and observation, the following statements (among others) are made. Of the gas vapours, xylene is by far the most powerful solvent for diaphragm oils, removing even the refractory oxidized oil compounds used on textile diaphragms. Among the gas vapours are liable to be some which, after deposition in a meter, become rancid, or acidify through chemical change. Also heavy hydrocarbons gradually deposit a non-volatile sticky compound on the diaphragms, valves, &c. These papers and discussions are concerned chiefly with the destruction of the textile diaphragms which were largely in use, and had given much trouble by perforation, breakage, &c. There is some reference to leather diaphragms, however, which are pronounced superior to the textile ones. It seems reasonable to suppose that a leather diaphragm, if kept continually saturated with oil, should deteriorate very slowly indeed from the action of these impurities. Our experiments on the action of ammonia on leather show a marked retardation of injury when the leather is thus thoroughly saturated.

Bleaching or Drying of Diaphragms.

In a paper by Mr. W. H. Gartley at this meeting ["Journal," Nov. 13, 1906, p. 449], are given the facts concerning the condensation of vapours from illuminating gas with falling temperatures, and also diagrams showing the average yearly temperatures of the atmosphere and of the general distributing-mains in Philadelphia. From these curves it will be seen that from the middle of July to about the 1st of March the average atmospheric temperature is below that of the mains; and consequently house meters which are so located as to experience about the atmospheric temperature will generally condense vapours from the gas which they receive from the street, provided it is saturated with vapours at this main temperature. The last condition will exist unless the gas has been subjected to very low temperature at the works before its discharge into the mains, or has passed through some exposed part of the mains. Furthermore, we have taken the trouble to place, and for the period of a full year very frequently read, maximum and minimum recording thermometers immediately adjoining meters in a large number of buildings, so chosen that they represented about average conditions. We find that the average of all these minimum temperatures is higher than that of the mains during the months of December, January, February, and March only, in which months buildings are experiencing their maximum heating; and that, on the other hand, the temperature of the street mains is the lowest. During every one of the remaining months of the year, the average meter appears to experience a more or less frequent fall of temperature below that of the mains—this condition existing to the greatest extent during the autumn. On the other hand, the maximum temperatures are, especially during the winter months, far above those of the mains—producing a superheated or drying condition of the gas at the meter; and in the case of many meters set in warm places, this condition will be long-continued and severe.

During the spring, summer, and autumn months, therefore, there is a general tendency towards the frequent precipitation of vapours in the meters. It is also worthy of note that, because of an affinity between the diaphragm oil and the vapours of the gas, absorption of the latter will occur to considerable extent, even if the temperature of the meter be somewhat above that of the mains. Our experiments have shown this fact; and it has been noted by other observers. These absorbed and condensed vapours are powerful solvents for the oil with which the diaphragms are saturated when placed in the meter. In meters which experience to a marked extent this absorption and condensation, the diaphragm oil is, therefore, quickly thinned by the precipitated vapours and drained out of the leather—leaving the diaphragm saturated with merely the volatile condensed vapours from the gas. If now the temperature of the meter be from any cause raised so that the gas which it is passing becomes superheated, there is a rapid evaporation of these vapours, and the diaphragm is soon left dry or bleached, and somewhat porous, stiff, and shrunken. Its registration is thereby effected; and, moreover, while thus deprived of the protection of its diaphragm oil, the leather is probably subject to injurious action by water vapour and the minute quantities of the various impurities and oxygen in the gas. The oil, once thus removed from the diaphragms and distributed over the bottom of the meter, will not thereafter be again absorbed by the leather, especially if the latter (as should be the case) stands clear of the bottom of the meter. During the remaining period of its service, therefore, the leather will be unprotected by any diaphragm oil. It may again become wet from deposited vapours; but it will immediately dry on a subsequent rise of temperature, and the registration of the meter will therefore vary according to its condition of dryness or dampness.

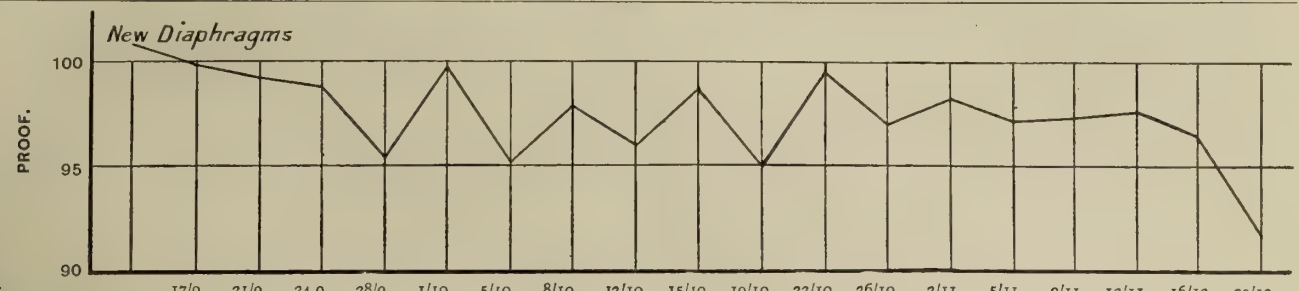
Much annoyance having been experienced from this bleaching of diaphragms, and the foregoing general explanation being arrived at, we have made very considerable special experiments to ascertain the exact facts concerning its effect upon registration, and have also expended much time and money in endeavouring to find a means of maintaining the diaphragm in a constant condition under the continually varying conditions of vapour deposition and drying already mentioned.

Our special experiments upon the bleaching of diaphragms and the consequent effect upon meter registration just alluded to were made as follows: A large number of boxes containing water were prepared, in which the meters could be set. The water in these boxes was artificially cooled, and the gas passing through the meters was thereby brought to any desired temperature. Before admission to the meters, the gas supply was cooled and scrubbed in external vessels to known temperatures relatively to the mains, so that its condition of vapour saturation was actually known. Gas was then passed through the meters in large quantity and for considerable periods—the temperature of the meter being successively lower and higher than that of the gas at its entrance into the meter, with consequent first condensation of vapours therein and the washing off of the diaphragm oils, and a succeeding evaporation of the condensed vapours, producing a drying or bleaching of the diaphragm. The meter was removed, drained, and proved at the conclusion of each low and high temperature period.

The accompanying curve, which represents the average record of one lot of three meters, is generally typical of the provings of such meters. The + and — temperature figures indicate that the meters were proved immediately after passing a quantity of gas this number of degrees above or below the temperature of the gas entering the meters, with consequent condensation of vapour or drying of diaphragm. Thus, under date of Oct. 5, the meters were proved immediately after passing 1583 cubic feet of gas, which in its passage through the meters was 15° above its temperature at the entrance, and consequently there had been a drying effect upon the diaphragms. It will be observed from the diagram that the meters most frequently run fast after drying (the *plus* period) and slow after wetting (the *minus* period) of the diaphragms. This was the general tendency of all meters tested. On raising the temperature of the meters to an excess of 51·7°, they ran over 8 per cent. fast, as shown at the close of the curve.

* The United Gas Improvement Company.

† See "Journal," Vol. XC., p. 885. ‡ *Ibid.*, Vol. LXXXVII., p. 882.



Date, 1905	17/9	21/9	24 9	28/9	1/10	5/10	8/10	12/10	15/10	19/10	22/10	26/10	2/11	5/11	9/11	12/11	16/12	23/12
Meter Temperature (Deg. F.) + or − to Inlet Gas	−5°	+5°	−10°	+10°	−15°	+15°	−5°	+5°	−10°	+10°	−15°	+15°	−5°	+5°	−10°	+10°	+3·4°	+51·7°
Gas Passed, Cubic Feet	1227	1550	1787	1653	1007	1583	1427	1560	1320	1563	1080	1507	1593	1143	863	1240	1010	2803
Total do., Cubic Feet	2777	4564	6217	7224	8807	10,234	11,794	13,114	14,677	15,757	17,264	18,857	20,000	20,863	22 103	22,113	25 916	

Diagram showing Variation in Proof of Dry Gas-Meters through High and Low Temperature Effects on "Non-Dipping" Diaphragms.

Even in other meters which were constantly kept at a temperature equal to, or a little above, that of the incoming gas, and in which, therefore, the latter was continually slightly superheated, the absorptive effect of the heavy diaphragm oil upon the vapours was ultimately such as to cause the same bleaching effects. The meters were in great part provided with glass fronts, through which the appearance of the diaphragms could be continually observed; and under the foregoing treatment they all showed bleaching. The passag e of 2000 to 3000 cubic feet of gas with a moderately low temperature of the meter was sufficient to produce this effect.

These experiments, therefore, fully reproduce the practical phenomena of the bleaching and drying of diaphragms, and explain their cause. It is evident, as is confirmed by numerous cases in our practice, that meters which have in every-day work been first subjected to temperatures which remove the diaphragm oil, and are subsequently, through house-heating or a rise of atmospheric temperature, subjected to warming and drying, are liable to register seriously fast. Moreover, a meter removed in this condition and proved and adjusted to correct registration with its diaphragms bleached, is liable to be set under such conditions that its diaphragms again become damp from vapours, when it will register slow. Moreover, the leather in this condition, being unprotected by diaphragm oils, is probably much more liable to gradual decay.

Evidently, therefore, to ensure constancy of registration and protection of the diaphragm leather, the latter must either be so prepared that its fibre shall not be acted upon by the gas and water vapours, or the oil or other diaphragm saturating compound must be rendered capable of continually saturating the leather, even while it is being acted upon by these vapours.

Although nearly all our efforts to attain the foregoing result were failures, and, moreover, the method finally adopted for trial is so simple as to warrant very little description, nevertheless a few brief remarks may contain something of interest. Our first efforts were directed towards the finding of a compound which would not be acted upon by the gas vapours, although we were aware at the outset that this would be a difficult matter. A very great number of oils were tried. We scarcely hoped to find one which, in its natural condition, would resist the vapours—the latter being such powerful solvents; but we hoped that we might at least find one which, by special preparation or method of application to the leather, could be made fairly refractory, or would render the fibre of the leather less liable to change of form. With some of these oils we had no success whatever under any conditions. Certain of the vegetable oils—especially boiled linseed, which is the substance chiefly employed in the preparing of the textile diaphragms which have heretofore been used abroad—were rendered somewhat refractory to the vapours when allowed to partially oxidize after their application to the diaphragm, and before the latter is placed in the meter. But even then they would gradually yield to the action of the vapours, or under drying action would harden so as to impede the motion of the meter. Several combinations of these oils were tried, and also various methods of applying them to the diaphragm, including heating in application and careful seasoning. "Soaps" or greases saponified, together with iron and aluminium, were also tried, without any success. Shrinking the diaphragms by immersing them in water, and then drying them before the application of the oil, were then tried. Diaphragms were lightly coated with collodion, which is quite refractory to the vapours, after the application of oil; but the bleaching of the diaphragm through this collodion film quite readily took place. "Flexible compound," which is probably a boiled linseed oil preparation, was tried; but it behaved largely like linseed oil.

Many materials other than the ordinary sheepskin were also tried, among them the following: Both plain and glazed kid, which makes an excellent leather, being firm and non-porous, and changing its shape less than sheepskin. It is rather expensive, however; and, in view of later developments, it seems unnecessary of adoption. "Chrome" tanned and other special tannings of sheepskin; very thin artificial leathers, which became too brittle; various special preparations of sheet rubber; and "*dichtungs-gummi*," a German sheet packing, which has nearly the flexibility and elasticity of pure sheet rubber. The last is remarkably refractory to the ordinary light solvent oils—showing scarcely any tendency to dissolve under their actions; but it absorbed sufficient of the vapours to expand considerably, which rendered it unsuitable for diaphragm use. Then there are silk, linen, and muslin, coated with oxidized linseed oil and flexible compound. These, being thin, would work well, even with a coating of oxidized oil; but this gradually yielded to the vapours, as has been found by foreign users of such diaphragms. Dozens of diaphragms prepared by the methods described were carefully tried in our experimental appliances; but none of them proved at all satisfactory.

Efforts along the foregoing lines having been unsuccessful, other means were sought. It occurred to the experimenter that possibly the capillary action of the leather could be made use of; and investigations were made in this direction. These showed the diaphragm leather to possess unexpectedly high capillarity. It varied with different oils; but it was found that a light machine oil would in three or four days rise 12 or 13 inches in strips of leather, which is the full height of an ordinary 10-light meter diaphragm. It will ultimately rise to a height of 28 to 30 inches, but at a much slower rate. In diaphragms, because of their form, this absorption is less rapid than in these strips. Nevertheless, a new and entirely dry 10-light diaphragm in the meter will become thoroughly saturated from top to bottom through this capillarity in from eight to ten days. It is evident, therefore, that if sufficient oil be placed in the bottom of the meter for the diaphragm to constantly slightly dip into it, the supply of oil upon the diaphragm will be continually quickly replenished, even if temporarily removed in part by condensed gas vapours. This is fully supported by the result of our practical experience with a large number of meters mentioned below; it being very rarely the case that a diaphragm removed from the most trying practical service is not found saturated with oil completely to the top. Moreover, even while the oil is thus temporarily partly removed, the leather will be wet with condensed gas vapours; and this tends to preserve its dimensions and ensure uniform registration.

Experimental meters thus equipped having shown very promising behaviour, about 35,000 meters have been so fitted and put into use during the last fifteen months at Philadelphia. A comparison of the proofs of these "dipping" meters with the proofs of the ordinary non-dripping ones, after the removal of each from service, invariably shows a superiority in the former. Even ordinary meters which had come from the shop within these fifteen months, and the diaphragms of which are therefore in equally good condition with those of dipping meters, show an inferior performance. Fifty of each kind of such comparatively new diaphragm meters recently proved, after nearly a year's work, showed an average net proof of 0·04 per cent. fast in the case of the dipping meters, and 0·8 per cent. fast in the non-dipping. A comparison of the proofs of all meters of each kind proved from Jan. 1 last to date is far more favourable to the dipping meters; the range of fast and slow registration in these being less than half of that existing in the non-dipping meters. In this latter comparison, it is natural that the non-dipping meters should show inferior behaviour to the dipping ones, because the latter had newer diaphragms. Nevertheless, this is the comparison, we believe, which shows most correctly ultimate conditions, as we have good reason to expect that the state of the diaphragms in the dipping meters will for a very long period remain practically the same as when new, whereas the non-dipping diaphragms are certain to experience injury.

While longer trial is necessary to completely establish the excellence of this method in every respect, we seem, from these results, to have every reason to expect a much improved behaviour on the part of the dipping meters. The mere fact that, on inspection, dipping diaphragms are almost invariably found, after service, to be thoroughly saturated with oil, seems to render it positive that serious cases of bleaching will no longer exist, and also that the diaphragm leather will be much less liable to decay and breakage. Consequently, the cases of abnormal slow and fast registration, which are productive of so much loss to the company or dissatisfaction to the consumer, will be avoided, as well as much of the considerable expenditure ordinarily required for meter adjustment and repair.

The dipping oil, even when newly placed in a meter, has no appreciable effect upon the candle power of the gas through absorption of vapours; this having been ascertained by direct experiment with meters subject to even very low temperatures. Being on the bottom of the meter, the oil comes in contact with but little of the gas at a time; and any absorption is exceedingly gradual and small. The oil we are trying is a moderately light,

pure mineral machine oil, from which has been removed all trace of whatever acids have been used in its refining. We have chosen this oil chiefly because it is at ordinary temperatures almost entirely inert and unchangeable chemically, having no tendency to become viscous by slow oxidation, or to slowly form acid or other compounds, which is probably not true of vegetable or animal oils. There seems, therefore, no possibility of its having, even ultimately, any injurious effect on the leather. It is also cheap; the cost of the quantity used in a 5-light meter being only 3 c. or 4 c. It is also absorbed by the diaphragms slightly more readily than any other oil we have tried. In its pure condition, it has a solidifying point of about 35° Fahr., which is a temperature reached by few meters. Moreover, the absorption of even a very small quantity of gas vapours by this oil renders it fluid at 23° Fahr.; and such vapour absorption occurs after the meter has been in use a very short time. Sufficient oil is placed in the meter to immerse about $\frac{3}{8}$ inch of the bottom of the diaphragm; the latter being previously saturated with the same oil. The quantity of oil required for an ordinary 5-light meter is 10 oz. in each compartment, or a total of 20 oz.

It is necessary, as is usual in the ordinary oiling of diaphragms, to let them stand or "season" for a week or ten days, after the application of the oil, before placing in the meter and adjusting the latter. It is better still that the meter be fully equipped with its dipping oil and thus stand before adjustment. This treatment seems, from our experience, to be necessary in order that the leather may experience full saturation and assume final shape.

Effect of Friction and Evaporation of Meter Condensation.

In the course of our work, questions have arisen which have led to the following couple of experiments. The investigations suggested by them we have been as yet unable to make, and the results are quoted simply as general information which may lead to further confirming experiment by others.

Friction of mechanism appears capable of causing very considerable variation in registration; and care in the packing of stuffing-boxes and in the neat fitting of the links, &c., is worthy of attention. The following experiment is quoted: To the crank-rod of a 100-light meter was attached a $3\frac{1}{4}$-inch diameter pulley, upon the perimeter of which was wound a cord acted upon by weights—these being so applied as to successively retard or assist the motion of the meter. A weight of 1 lb. caused the meter to register 8 per cent. slow when retarding the motion of the meter, and nearly 7 per cent. fast when assisting its motion. It is probable that the chief effect of friction is to slightly change the length of stroke where there is any play of mechanism; and even slight change of this kind can quite appreciably affect registration. This friction effect would probably, therefore, differ in every meter. This one experiment is cited simply to show general effects. It appears to indicate, for instance, that a meter which is adjusted with tight or binding mechanism, and subsequently eases up through wear, will run fast. This agrees with our practical experience.

If a meter contains condensed gas vapours, it may still register gas about correctly; the latter being generally saturated with these vapours, and having no tendency to pick up the condensation. In the proving of such a meter with air, however, the air readily absorbs condensation, with consequent increase in volume; and the meter is liable, therefore, even if measuring correctly, to apparently run fast. The action in this case is quite complex. The vapour formed will tend to increase the volume of the air; while the simultaneous lowering of temperature through this evaporation will tend to diminish it. Moreover, these effects will take place gradually while the air is being received and discharged by the diaphragms, and both will be affected by the rate of passage of the air through the meter. To ascertain approximately the net results of these various effects in meter proving, the following experiment was made: A number of meters containing condensation were proved. The air discharged from them was run into another prover and its volume noted; and simultaneously the temperature of the air at the exit from the meter was observed. The meters and all parts of the apparatus were at one temperature at the beginning of the trial. On four successive proofs, passing 8 cubic feet of air on each proof, the average increase in volume of the discharged air as measured in the outlet prover at the constant room temperature varied from 2·9 per cent. on the first test to 1·65 per cent. on the fourth. The temperature of the air was lowered 7° in each proof in passing through the meter. The net result of these opposed effects was to cause the meters to register from 1 to $1\frac{1}{2}$ per cent. fast on the first proof; the error being, however, small after this first, and diminishing to almost zero on the last. It therefore seems that, though the maximum error is not very serious, the passage of a few feet of air through a meter before taking its proof tends towards greater accuracy in showing its actual displacement or registration.

The railway surrounding Vienna, which has been in operation for upwards of ten years, is worked by steam; and it has from time to time caused complaints. The result has been a decision to substitute electricity; and on the 26th of last month a trial trip was made with an electric locomotive. It has been decided by the Government authorities to introduce a change in the system of lighting the carriages, by adopting inverted incandescent burners on the Pintsch system.

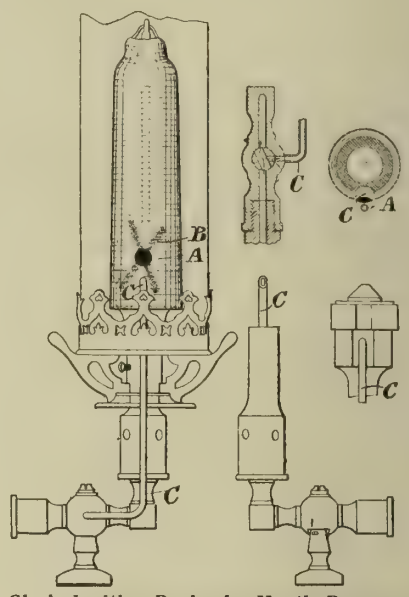
REGISTER OF PATENTS.

Igniting Devices for Incandescent Burners.

Glas, E., of Prossnitz, Austria.

No. 24,223; Nov. 23, 1905.

Instead of placing the igniting pellet (as usual) at the top of the mantle, where it is (when the burner is in use) always in the heat of the flame, and consequently deteriorating, the patentee proposes to attach it to a part of the mantle not intended to be rendered luminous except for the period necessary to light the burner by a current of gas directed towards the pellet by manipulating the tap so as to cut off the gas supply when the burner is lighted.



Glas's Igniting Device for Mantle Burners.

As shown, the igniting medium is a pellet A, with igniting strips or cords B placed on the part of the mantle which is pushed over the burner-head and lies beneath the edge of it. This part is ordinarily never encountered by the gas passing through the burner, nor by the flame or combustion products. To enable the igniting medium to be encountered for awhile by the gas, and thereby made operative, a pipe C connects with the gas-tap, and is bent upwards parallel to the mixing-tube of the burner. When the mantle is put on, the upper end of this pipe lies quite near the igniting pellet. The plug has, in addition to the ordinary bore, a smaller perforation arranged so that it is closed when the tap is entirely open or entirely closed. When, however, the perforation corresponds with the lower end of the main pipe, the pipe which leads to the burner is also opened, but only to a small extent; so that in this position of the tap, gas can escape both to the burner and also to the igniting pellet. When the pellet and strips have become incandescent, and thus ignited the gas flowing to the mantle, the tap is entirely opened. By this latter action, the main gas-pipe is closed and the flame at the upper end of the pipe C is extinguished.

Prepayment or Coin-Actuated Gas-Meters.

Sutherland, A. G., of Birmingham.

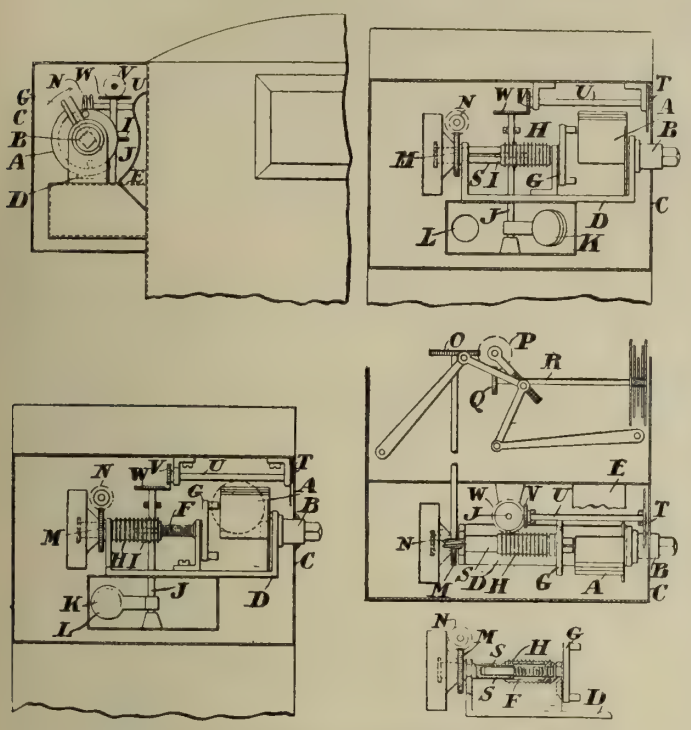
No. 24,382; Nov. 25, 1905.

This invention, relating to prepayment or coin-actuated gas-meters, has for its object to simplify the controlling mechanism and to arrange for the convenient delivery of gas in quantities variable with the amount of prepayment.

In carrying the invention into effect as illustrated on p. 39, there is a slotted or forked coin-carrier A at one end of a rotatable spindle B, which passes through an aperture in the enclosing case C. At the outer extremity of the spindle is an operating handle, whereby the spindle and coin-carrier can be rotated. In conjunction with the coin-carrier is a suitable stop for abutment upon the frame D of the mechanism. After rotating the carrier through half-a-revolution, further movement is prevented by contact of the carrier with the frame D. When in its initial position, the coin-carrier is in alignment with a coin insertion aperture in the case of the mechanism. By revolving the carrier, it is brought into alignment with a discharge aperture through which the coin automatically falls into a coin receptacle (not shown). During the rotation of the carrier, the coin is prevented from dislodgment by a curved abutment piece E arranged between the inlet and the outlet apertures.

In alignment with the carrier spindle B is an ordinary operating screw F, for the meter valve controlling mechanism, and at the end of the operating screw adjacent to the coin-carrier a clutch disc G or bar is provided; a pair of projections at opposite extremities of a diameter of the disc engages with a coin placed in the carrier, as shown by dotted lines. The screw also engages with a cylindrical nut H, around which circumferential grooves are cut, so that it can be made to serve as a rack for gearing with a pinion I secured to a delivery valve operating spindle J.

The delivery valve consists of a disc K adapted to close an aperture L in the side of the meter, and is supported by a radial arm secured to the valve-spindle J. On rotating the spindle, the valve K is withdrawn from, or advanced towards, its seating in the usual well-known manner. On the insertion of a coin in the carrier and its rotation by the handle,



Sutherland's Prepayment or Coin-Actuated Gas-Meter.

the operating screw F is actuated by the engagement of the coin with one of the projections on the clutch disc G. A lateral movement along the screw is in consequence imparted to the rack H, which results in the opening of the valve K, through the medium of the pinion I and valve-spindle J.

For the automatic closing of the valve K, the rack H is adapted to be rotated upon the screw spindle F by a worm wheel M engaged by a worm N, which is operated from any convenient portion of the meter mechanism—such as through the medium of a worm wheel O gearing with a worm P, with which also engages the worm wheel Q on the main spindle R of the consumption recorder. The worm P is automatically rotated by the ordinary measuring movements of the meter in the usual manner. During the passage of gas through the meter, and the consequent rotation of the worm P, the rack H is rotated; and, due to its nut-like engagement with the screw spindle F, it is moved along the latter towards its original position. This movement results in the actuation of the valve-spindle and in the gradual closing of the delivery valve upon its seating. To permit the necessary relative lateral movement of the rack H with respect to the wheel M, the rack is feather-keyed to a bush-like extension S, which fits over the end of the screw F and is connected to the wheel M.

When it is desired to obtain a greater quantity of gas than that corresponding to the value of the single coin (such as a penny) by which the meter can be operated, a number of such coins are successively inserted, and the handle rotated after each insertion. A proportionately increased movement is thereby imparted to the delivery valve. Thus the meter can with but one prepayment of two or more coins be readily adjusted to deliver corresponding quantities of gas within a convenient range determined by the limit of the lateral movement capable of being imparted to the rack H on the operating screw F.

For indicating the number of coins inserted at each prepayment, any ordinary indicator with index finger T may be provided on the meter case. Thus, the index finger can be secured upon a spindle U adapted to be rotated by a wheel V gearing with a wheel W on the spindle J. With each insertion of a coin, and consequent operative movement of the delivery valve, the index finger is moved to correspond therewith; while during the gradual closing of the valve, as the gas is delivered therethrough, the finger is simultaneously returned to its initial position. The indicator also serves during the working of the meter to record—in terms of the value of the operating coin—the amount of gas that will be delivered before the valve K is completely closed and another payment is required.

To provide for varying the quantity of gas obtainable by the insertion in the meter of a coin or coins as described, the worm wheel M is arranged in detachable connection with the bush S, so that it can be readily replaced when required by one of smaller or larger diameter.

Lamps for Inverted Burners.

FRANCIS, A. S., of Farringdon Road, E.C.

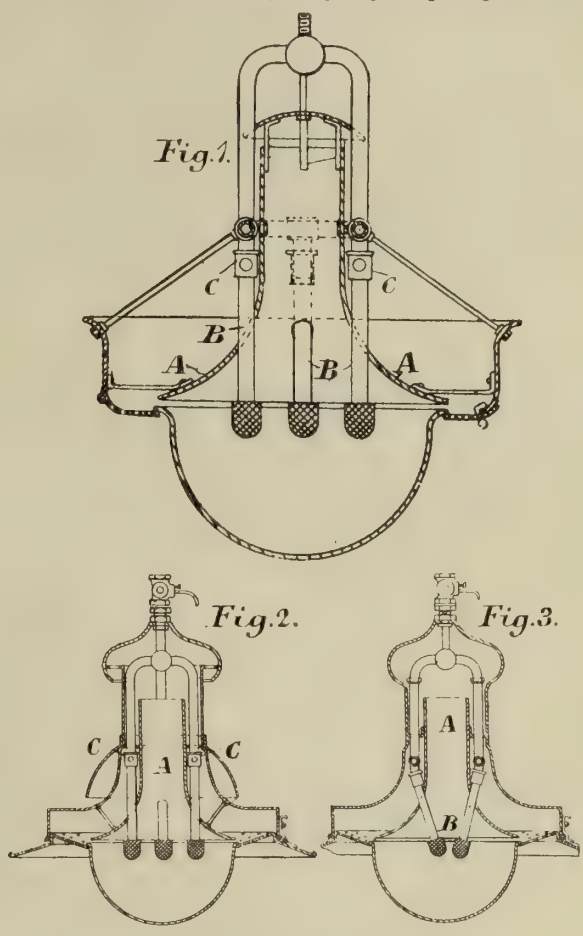
No. 24,410; Nov. 25, 1905.

This invention—relating as it does to lamps for containing incandescent gas-burners of the type in which a cluster of two or more inverted burners is employed in a globe or lantern—has for its object "to increase the efficiency of the burners in such lamps, and to render them readily accessible for cleaning, adjustment, and repair."

Fig. 1 is a sectional elevation of an indoor lamp, and figs. 2 and 3 are similar views of two constructions of outdoor lamps.

Fig. 1 shows the lamp provided with a trumpet-shaped chimney A (more or less like the frustrum of a cone), the wider part of which is below. The burners B are preferably merely straight metal bunsen tubes provided with gas-nipples and with mixing-chambers C at the top and suitable mouthpieces and mantle supports at the bottom, but without deflector or other like contrivances. They pass vertically through holes in the side of the chimney near the lower end; so that the points of the burners are within the cone of the chimney, while their mixing-chambers or heads, with the air inlets, are outside of the chimney. Thus the products of combustion flow straight up within the chimney, away from the air-inlets. The globe is preferably, but not necessarily, entirely closed at the bottom, and is suspended from an annular hinged plate provided with a number of holes to admit air to the interior of the globe, so as to support combustion, and, if desired, to the upper part of the lamp for the supply of additional air to the mixing-chamber.

If the lamp be intended for use out of doors, the upper part is made as shown in fig. 2—encased and provided with a domed top to prevent the ingress of rain and wind; the products of combustion rising up the cone-shaped chimney and escaping by way of openings below the top



Francis's Inverted Burner Lamps.

or cowl of the lamp, as usual with street-lamps. The lower part of the chimney A is enclosed by an outer chimney, so as to leave sufficient space for the air to pass to the mixing-chambers of the burners. This outer chimney may also be provided with holes for the admission of air to supply the burners, and the holes may be shielded from rain and direct draughts by an annular cap or covering. The outer chimney, its extension, and the top, may be in one piece or separate; while the extension and the outer chimney are in one piece. Air is admitted through the perforations in the annular plate supporting the globe.

As shown in fig. 3, the burners are not quite vertical; being slightly inclined towards each other. The outer chimney may here be fitted to the inner chimney by the flanged part, and the top of the lamp be made in one piece with the annular extension.

Mantles for Incandescence Gas Lighting.

LAKE, H. H.; a communication from the DEUTSCHE GASGLÜHLICHT AKTIENGESELLSCHAFT (Auergesellschaft), of Berlin.

No. 24,949; Dec. 1, 1905.

In accordance with the present invention, the place of attachment of the inverted mantle to the supporting ring is reinforced by the application of a mass consisting either wholly or in part of fireproof material, applied either before or after the treatment with collodion. The defect that it is desired to eliminate is mainly attributable to the fact that at the place at which the fabric comes into contact with the supporting ring it is not sufficiently incinerated when the burning off is effected, because the supporting ring conducts away too quickly the heat of the burning-off flame. If, however—even after burning off—there is applied to the incinerated or skeleton fabric, where it comes into contact with the supporting ring, a hardening and heat-resisting mass consisting of inorganic substances, or of inorganic substances mixed or combined with organic binding materials of any appropriate kind, the defect arising from the reduction of the strength of the incandescing body at the place of connection by the burning off is compensated for.

Globes for Inverted Incandescent Burners.

HELPS, G., of Nuneaton.

No. 26,407; Dec. 18, 1905.

This invention consists in providing means whereby the air entering the bottom of the globe of an incandescent burner and passing to the outside of the mantle is caused to enter by a number of small streams, so that the mantle is protected from damage by draught.

For this purpose, a ball may be used of glass or metal, so arranged

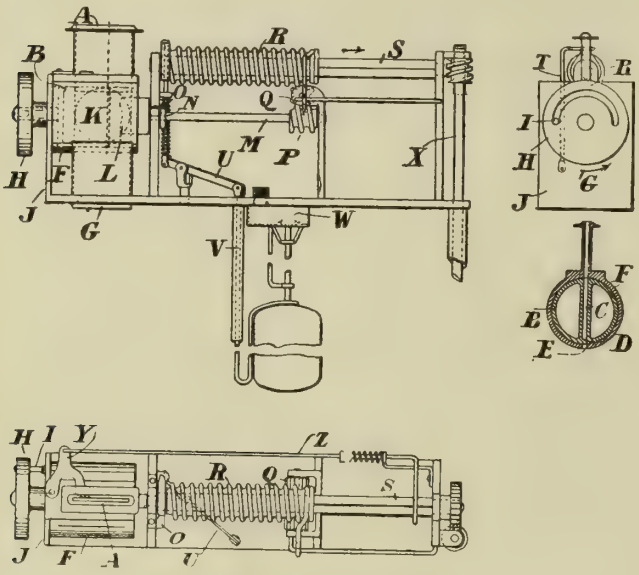
that, when on its seat in the globe, it allows just sufficient air to pass for proper combustion, and it also allows of a torch being inserted through the hole to light the lamp without difficulty—the ball, when the torch is withdrawn, rolling back on to its seat. Such solid balls, the patentee remarks, have been used in lamps in lieu of lighting-doors; but they have not been employed as screens as described. The ball may take many forms. The seat for the ball may be continuous, and the ball fluted on its circumference, so that, when it is on its seat, sufficient air passes into the globe for combustion; or the ball may be hollow, having holes all over its surface.

Coin Slot-Meters.

KING, M., of Wickham, and JAMES, J. E., of Islington, both in New South Wales.

No. 24,533; Nov. 27, 1905.

This coin-actuating mechanism (here illustrated in connection with a wet gas-meter) comprises a carriage having a coin pocket, means to give the carriage a half-turn and drop the coin therefrom, means whereby the half-turn causes a worm to slide a predetermined distance, means whereby the worm is automatically returned through the action of the meter, the provision of a cam upon the worm shaft, an arm released when the worm slides, connections from the arm to a valve allowing it to open when the arm is released, and a tube forming a water seal.



King and James's Coin Slot-Meters.

In the illustration, the mechanism is shown apart from a meter, and without the casing, cash-box, and indicator (or dial) used—viz.: (1) A side elevation of parts when all gas paid for has been supplied, the mechanism being locked, but ready to be operated on the insertion of a coin; (2) a plan view; (3) a left-end elevation; and (4) a vertical transverse section.

A is a coin shoot or passage; B a cylindrical carriage having a coin pocket C, and base D on which the coin may rest; and E an aperture in the carriage casing F to discharge the coin when the carriage is given a half-turn—the coin then dropping, as through passage G, into a cash-box. H shows a handle adapted to turn the carriage, and I a stop on the framing J—to limit the travel of the handle and carriage so that, before the half-turn is made, the coin can enter the carriage and take the position K. L indicates a slot in a lug on a shaft M, having suitable means to prevent the turning of it backwards. A ratchet wheel N, having at least two opposite notches or teeth, with a spring pawl or pressure stop O, is used. The lug is turned a half-circle each time a coin is dropped from the carriage.

Mounted on the shaft M is a worm P geared to turn a pinion Q, which engages with a worm R slidably mounted on a shaft S. The pinion turns and the worm slides a predetermined distance—for example, one thread turn—when the handle H is turned and a coin is admitted to, and dropped from, the carriage B.

Mounted on the worm R is a cam, which, before the insertion of the coin, holds up one end of the arm T attached to the lever U, which has an arm V so mounted relatively to the float valve that its motion governs that valve. While another cam holds up the arm T, an eye or stop on the arm V keeps the valve float down; and so the valve is closed so that gas cannot enter the meter. But when the worm R slides forward, the arm T drops—being assisted or forced down by a spring or the like. This operates the lever U and arm V, raising the stop so that the float rises, whereupon the valve W opens and admits gas to the meter. When enough gas has been consumed, mechanism (hereafter explained) causes the eye or stop to descend and close the valve. A toothed wheel on the shaft S gears with the worm on the meter spindle X by which the usual meter index train is operated.

As gas is consumed, the spindle X turns the shaft S; and the pinion Q being kept stationary, the worm R not only turns, but also slides back towards the arm T. The pawl pressure on the ratchet N is made sufficient to resist any tendency of the pinion Q to turn. At the end of the worm R is a recess or support for a loose ring which does not turn with the worm, and which carries a pointer to indicate the number of coins inserted in respect of which gas is still consumable. If, for example, three coins were inserted and the worm R thus carried a distance of three threads in the direction of the arrow, the pointer would indicate 3; then when the consumption of gas began, it would indicate in due time 2, then 1, and finally 0. The worm R will have returned to its starting point when all the gas paid for has been consumed; and the cam will then have passed under the end of the arm T and raised it so as to close the valve W.

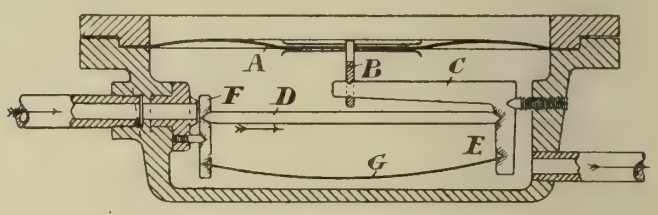
The tooth wheel is changeable—allowing one with more or less teeth to be substituted according to the price of gas. Z represents a rod so located that, when the coin effecting the maximum prepayment—for example, the twelfth penny—has been inserted, the worm R will press the end of the rod Z and cause the other end of the rod, which is connected to a cut-off plate Y, to swing the plate so that a lug on it enters an aperture in the coin-shoot side and prevents any additional coin descending beyond the lug.

Gas-Pressure Regulating Devices.

HOWARTH, F. W.; a communication from AKTIEBOLAGET GAS-ACCUMULATOR, of Stockholm.

No. 6425; March 16, 1906.

This gas-pressure regulating device is designed to maintain a certain constant pressure in a gas-conduit notwithstanding variations of pressure in the conduit prior to reaching the apparatus.



A Swedish Gas-Pressure Regulating Device.

One wall of the casing shown comprises a diaphragm A connected through a link B with a lever C mounted to turn on fulcrum points fixed to the casing. A bar D is inserted between the lever (or a projection E depending from same) and a plate F, against each of which it bears at its ends, which are pointed. The plate serves as a valve, and is mounted to rock on points fixed to the casing or to a separate piece secured to the casing. Between the lower part of the valve plate F and the lower part of the lever projection E is inserted a blade spring G, the strength of which is adjusted in such a way that the spring counterbalances the gas pressure on a diaphragm when the pressure corresponds to that required in the outlet conduit. Variations of pressure will cause the diaphragm to ascend or descend, so that the blade spring is expanded or depressed, and the valve plate correspondingly moved towards, or removed from, the valve seat by means of the bar D; the flow of gas through the valve being accordingly diminished or increased until the valve plate, owing to the diminished or decreased pressure in the casing, returns to its original position controlled by the diaphragm and spring.

Electrical Ignition of Gas-Lamps.

ELECTRICAL IMPROVEMENTS LIMITED and A. E. HACKING, of Nottingham.

No. 6441; March 17, 1906.

The manner proposed for electrically lighting up gas-lamps consists in providing for the burner of each lamp a complete compound switch, preferably arranged to have three functions—namely, to simultaneously close a low-tension circuit, a sparking circuit, and turn on the gas, applying the switch, as the most convenient arrangement, to the gas-pipe feeding the burners. There are battery terminals and spark-coil terminals forming part of the switch to be simultaneously closed. One battery and one sparking coil are used, and branch wires for each lamp are taken from main wires from the battery and coil in such a manner that each individual switch controls both the battery and the coil. In this way the operation of a single element at the burner closes the battery circuit and the sparking circuit, and turns on the gas—there being, however, a compound switch for every lamp, with a switch capable of independent operation.

Photometrical Apparatus.

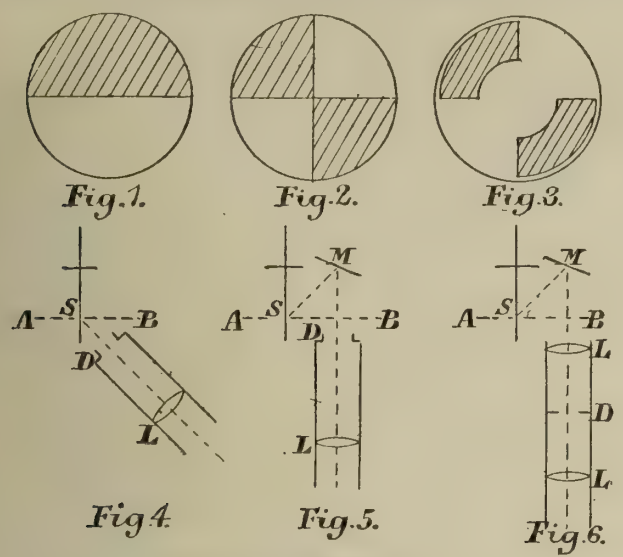
WILD, L. W., of York Street, Westminster,

No. 7543; March 29, 1906.

After explaining in general terms the use of waxed discs in photometers, the patentee proceeds in his specification to say: If a disc, as described, is viewed through a diaphragm, so that the eye sees a portion of the disc only, and the disc is then rotated on its centre in such a manner as to present to the eye alternately and in quick succession first an opaque reflecting area and then a translucent diffusing area, a distinct flicker will be seen so long as the two portions of the disc are not equally illuminated. The flicker occurs each time the dividing line between the two portions of the disc crosses the field of view. By adjustment of the distances between the disc and the lights, the flicker can always be made to entirely disappear—provided that the lights are of the same colour. This occurs when both portions of the disc are equally illuminated. Should the lights differ as to colour, the flicker can still be made to disappear on adjusting the distances between the disc and the lights—provided always that the speed of rotation attains a greater value than a certain critical speed. It would appear as if the speed at which the flicker due to difference of colour disappears is considerably lower than the speed at which the flicker due to difference of intensity disappears.

The advantages of using a rotating disc, as described, over other forms of flicker photometer are said to be two—namely, the two sides of the disc being always parallel, any tilting due to side-play between the carriage on which the screen is mounted and the bar or rails on which it runs involves no appreciable error, as the two sides of the screen are affected about equally; and, also, should either of the lights

be out of alignment by a small angle, the illumination on the screen is inappreciably affected; whereas in photometers consisting of two reflecting surfaces inclined in opposite directions, the error due to tilting may amount to as much as 4 £ for each degree of angular side-play and 2 £ for each degree of angular displacement of one light only.



Wild's Flicker Photometer Discs.

Figs. 1 and 2 show two forms of disc, consisting of white absorbent paper, the shaded portion of which has been made translucent and diffusing by the application of paraffin wax or other suitable material. Fig. 1 shows a disc which gives rise to two flickers per revolution, and fig. 2 a disc which gives four flickers per revolution, which allows of the speed of rotation being reduced if desired. Fig. 3 shows a built-up disc; the shaded portion being translucent. Figs. 4, 5, and 6 show three methods of viewing the disc.

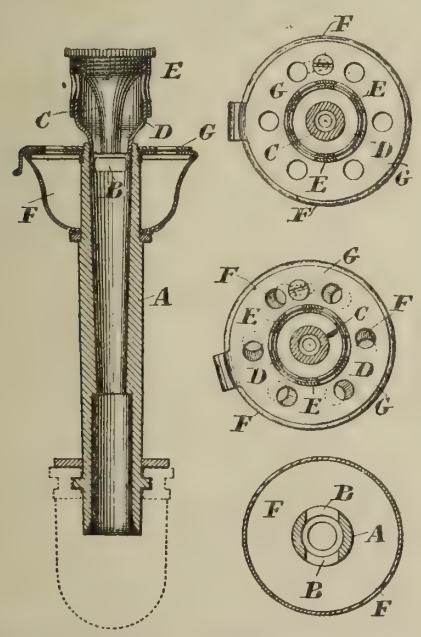
In fig. 4, the lights A and B shine upon opposite sides of the disc S, which is viewed at an angle of about 45°, through the diaphragm D and lens L. In fig. 5, the mirror M has been added, so as to bring the observer's eye into a more convenient position. The chief objection to this method of viewing the disc is that the disc, when revolving, shows no detail, and is not easily focussed by the eye; and if a diaphragm is added, the eye focusses upon this, and the disc being far off is out of focus. In fig. 6, a telescope has been substituted for the simple lens and diaphragm. The lenses L are so arranged that when the eye is focussed upon the diaphragm D the disc S is also in focus—"thus securing the maximum degree of sensitiveness and the minimum fatigue to the eye."

Inverted Incandescent Gas-Burners.

Singleton, J. E. E., of Wolverhampton, and Spreadbury, E. L., of Northampton.

No. 6761; March 21, 1906.

In the burner-tube A are formed additional or secondary apertures B, so as to admit of a supply of air to the burner-tube at a point immediately below the axial gas-nipple C, which is made somewhat longer than is usual. The upper part D of the burner is of the ordinary construction, and is fitted with the perforated ring or sleeve E, by the



Singleton and Spreadbury's Inverted Incandescent Gas-Burner.

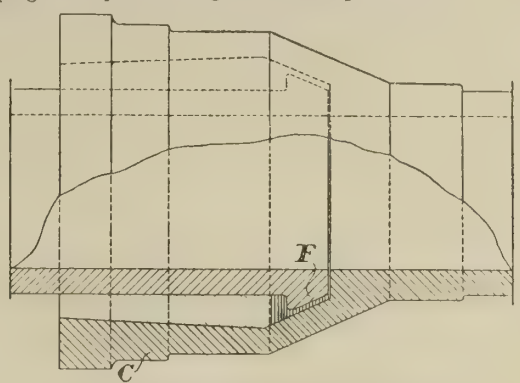
turning of which the ordinary air-admission holes of the inverted burner are regulated. The air holes B open into an annular chamber F, the flat top of which is perforated and provided with an adjustable perforated ring G, by the partial rotation of which the holes can be more or less contracted or wholly closed. By the secondary air supply to the burner-tube at a point immediately below the gas-nipple C (which is made somewhat longer than usual), a more efficient admixture of gas and air is said to result than with the ordinary inverted burner, or with inverted burners having a secondary air supply as hitherto. The improved burner-tube is made to gradually taper internally from its upper to near its lower end, so that the speed of the mixture of gas and air passing down it may be caused to gradually increase. In conjunction with the secondary air supply immediately below the nipple of the burner, the tendency to back-firing is claimed to be wholly or in great part overcome—the flashing-back point being removed to a point coincident, or approximately coincident, with the part of the tube of smallest internal diameter.

Joint for Water and Gas Mains.

Ford, G. T., of Tottenham Court Road, W.C.

No. 15,379; July 6, 1906.

This arrangement has been designed with the object of preventing any slipping of the joints owing to excessive pressure on the mains.



Ford's Joint for Water and Gas Mains.

The spigot and socket would be cast as at present, with the following variations. The spigot would be finished with a splayed projecting bead F, and the socket C cast to correspond with the end of the spigot; the socket being much shorter than the standard size. The splayed projecting bead and the socket are formed so as to fit so closely together as to become practically air tight, even before the lead is used for jointing.

The joint has, it is said, been designed with a view to a great saving of lead in the laying of mains. For example, a standard pipe, 1 foot in diameter, would take 19 to 20 lbs. of lead to make the joint; while this joint, with its splayed projecting bead and shorter socket, would, it is claimed, only require 14 to 15 lbs.

APPLICATIONS FOR LETTERS PATENT.

28,689.—Société Anon. des Combustibles Industfielles, "Distillation of hydrocarbons." Dec. 15.

28,752.—Sweet, A., "Gas cooking-ovens." Dec. 7.

28,761.—William Cross and Son, Ltd., and Cross, J. W., "Gas cookers or grillers." Dec. 17.

28,783.—Hamaker, J. I., "Combined heating and cooking stoves." Dec. 17.

28,796.—Abel, K., and Pervesler, F., "Lighting gas at a distance." Dec. 17.

28,834.—Crossley, W. J., and Rigby, T., "Producer gas-generators." Dec. 18.

28,881.—Hollick, T. D., "Automatic grabs." Dec. 18.

28,891.—Spangenberg, F. A., "Opening and automatically closing gas delivery-pipes." Dec. 18.

28,898.—M'Mahon, P. V., "Liquid meters." Dec. 18.

28,949.—Webb, H. R, "Lighting inverted burners." Dec. 19.

28,963-4.—Woltereck, H. C., "Production of ammonia." Dec. 19.

28,990.—Kent, W. G., "Liquid-meters." Dec. 19.

29,000.—Lake, H. H., "Gas-burners." A communication from J. H. Ackroyd. Dec. 19.

29,025.—Davis, H. N., "Gas cooking-stoves." Dec. 20.

29,026.—Price, H. A., and Turner, H. C., "Gas-fires." Dec. 20.

29,038.—Thorp, T., "Water-meters," &c. Dec. 20.

29,040.—Lea, J. W., and Perrins, J. H., "Dust-traps and gas-regulators." Dec. 20.

29,078.—Rogers, W. J., and Woosnam, W. W., "Effecting the discharge of measured quantities of fluids into tanks or reservoirs intermittently filled and emptied." Dec. 20.

29,115.—Boult, A. J., "Combustion of gaseous fuel." A communication from E. Bohon. Dec. 20.

29,123.—Nehmer, H., "Electrical apparatus for lighting gas." Dec. 21.

29,132.—Thorp, T., "Rotary blowers." Dec. 21.

29,155.—Norden, J., "Mantles." A communication from C. Bartel. Dec. 21.

29,163.—Constable, S., "Self-propelled vehicles for spraying tar on roads." Dec. 21.

29,173.—Falk, S., "Mantle-supports." Dec. 21.

29 201.—Allgemeine Elektricitäts Ges., "Meters for gas and the like." Dec. 21.

29,205.—Gas-Meter Company, Ltd., and Gow, J., "Coin-freed gas-meters." Dec. 21.

29,223.—Grossmann, J., "Treatment of ammonia liquors before and after distillation." Dec. 22.

29,231.—Hurlebusch, H., "Portable gas-producer, purifying apparatus, and gas-engine." Dec. 22.

29,252.—Ehmann, C. P., "Bunsen tubes." Dec. 22.

29,284.—Spreadbury, R. J., "Inverted lamps." Dec. 22.

29,291.—Duncan, G., and Hardie, W., "Manufacture and purification of illuminating gas." Dec. 22.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

Electrolysis as a Cause of Fire.

Sir,—Referring to the editorial remarks on the "Relative Dangers of Gas and Electricity" in the "Journal" for Dec. 18, I may say we have had an experience which is probably somewhat unique, and at the same time highly instructive. A fire arose at a laundry where gas was found burning from a 1½-inch lead outlet-pipe near the meter. Luckily the fire was speedily put out, before the evidence of the originating cause of the ignited gas-pipe was obliterated. This pipe showed that it had been pierced and lighted by an electric spark about ½ inch in length, which had passed from an adjacent steam-pipe. The problem arose as to how the spark had been caused. The steam-pipe was nowhere near an electric wire. But immediately before the fire arose an electric motor had gone wrong, and a fuse burnt out. The electricians could not gainsay the evidence of the facts that electrolysis had taken place between the two pipes; but they could offer no explanation of the phenomenon. It occurred to me that the breaking of the primary circuit had induced a momentary secondary current in the steam-pipe, which was well-insulated, causing a high-potential spark to pass to the gas-pipe. This theory was accepted by the electrical engineer as being the only satisfactory one under the circumstances.

We have had two or three instances of gas-pipes being pierced and ignited through the breaking of motor circuits; but in these cases it appeared to be due to the earthing of the current. The induction theory may explain other fires caused by the gas escaping and burning where no evidence remains.

York Gas-Works, Dec. 22, 1906. J. H. Hill, Assistant-Manager.

Recent Railway Accidents and the Safety of Gas Lighting.

Sir,—I was very pleased to read the article on the above subject in your last issue, as it is quite in accord with my own experience of years ago; and I notice that your contemporary, the "Engineer," in its issue of the 21st inst., takes a similar view. I believe that Lieut.-Col. von Donop is imaginative in attributing any undue danger to the use of gas for the lighting of railway carriages.

Having been associated with the running of the first gas-lighted coaches on the main line of the Great Western Railway, I know the question of possible danger was fully considered. Experiments were made with the gas-cylinders secured on the under-frame of a carriage with the connecting pipes, to show the effect of violent impact, which was communicated by fly-shunting to represent the effects of collision and derailment. It was always found that the cylinders were unaffected, and whatever fractures took place were in the connecting-pipes, where the gas escaped so slowly into the open air that there was little possibility of danger.

I have also had several opportunities of examining the gas-fittings of coaches after actual collisions. One instance I remember in particular, on the District Railway at the Gloucester Road Junction. In this case, the lights were extinguished by the collision, and some of the small pipes fractured, so that the gas escaped gradually out of the cylinders without doing any harm.

Of course, the great point to be considered by railway companies above everything else is the question of public safety. I agree with you that electricity does not give immunity in this respect; and, although I have watched the progress of train lighting by electricity since Mr. Stroudley first introduced it into the Pullman cars on the Brighton Railway, I cannot consider that—in respect to the cost of fitting up the coaches, the cost of running, the efficiency of the lighting, or safety—it can commend itself as altogether satisfactory to the railway companies themselves, except in the case of tube railways. I came to this conclusion years ago, after prolonged investigation at home and abroad of the various ways adopted for lighting railway stock; and although my work has for some years now been in an altogether different direction, yet I have never lost interest in the subject, which always had a fascination for me, as it opened up possibilities which are gradually being realized.

In America, it is interesting to note, bracket gas-lights are in use in observation cars over the writing tables.

In the "Journal" during the eighties will be found a record of experimental work done in this respect by myself and in conjunction with the late Mr. F. W. Hartley and Mr. Frank Clark; and when a few years back I saw the adoption of the incandescent mantle for carriage lighting carried out on the French and Swiss Railways, I could not help feeling what a chance the railway engineer now had in securing efficiency and economy in lighting, combined with effective ventilation, which is not the least important advantage of gas lighting, even in a railway carriage, with the windows closely shut and the influenza microbe paramount.

Hastings, Dec. 27, 1906. Chas. E. Botley.

Leek to Supply Rudyard with Gas.—The Leek Urban District Council have agreed to a recommendation of the Gas Committee that a scheme for supplying Rudyard and Longsdon with gas should be carried out, and that application should be made to the Local Government Board for a loan of £1800 for the work. The North Staffordshire Railway Company have granted permission for the necessary main to be laid along their track, subject to the payment of a yearly acknowledgment of £1, and a discount of 10 per cent. from the price of all gas supplied to the Company's premises—the Council to be liable for any accident which may happen, and which could not have happened but for the pipes being so laid along the line. The arrangement is to be for 21 years; and the Council will then have the option of renewing the lease on the same terms.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Nov. 26.

(*Before Mr. Justice* Jelf.)

Chester Water-Works Company v. Guardians of Chester Union.

In this case the question for the decision of the Court was whether the Guardians of Chester Union were entitled to a supply of water for their workhouse at the rate charged for domestic purposes.

Mr. Balfour Browne, K.C., Mr. Randolph, and Mr. M. Gwyer (instructed by Messrs. Busk, Mellor, and Co.) appeared for the plaintiffs; Mr. Danckwerts, K.C., Mr. Montagu Lush, K.C., and Mr. Ellis Griffiths (instructed by Messrs. Chester and Co.) represented the defendants.

Mr. Balfour Browne, in opening the case, said that in 1876 the defendants applied to the Water Company for an estimate of the cost of carrying a 6-inch main to the workhouse. The Company gave an estimate and agreed to bear an expense of £200, on condition that they were paid for the water supplied a minimum sum of £20 per annum for three years—the charge being dependent entirely on the quantity of water taken. The pipes were duly laid and a meter was put up; and on Feb. 14, 1877, the Guardians accepted the Company's offer, and were supplied by meter from that time at the rate of 8¼d. per 1000 gallons. This arrangement continued till 1899, when the Guardians applied for a reduction in the charge; and in January, 1900, the Company agreed to allow a discount of 10 per cent. when the consumption exceeded a million gallons per quarter. This went on for some time; but in 1901 a discussion took place at a meeting of the Guardians, and a resolution was passed requesting the Company to remove the meter, and demanding that they should supply all the water required as for "domestic purposes," under section 43 of their Act of 1857, by which the Company was incorporated. In December, 1901, the Guardians discontinued the use of a certain wood-chopping machine in the workhouse; but they paid for the water used in the September and December quarters. In January, 1902, the Guardians tendered the sum of £12 1s. 3d., which they said was the quarter's rate in advance, calculated on the annual value of the premises supplied, which was about £960. This, however, was not a good tender, because they tendered only on the annual value, and did not add anything for the extra water-closets, baths, &c., for which the Company had a right to charge even if they were obliged to give a domestic supply on the annual value. The Company offered to refer the question to arbitration; but the defendants would not agree to this. After some negotiations, on July 6, 1904, the plaintiffs issued the writ in the action. The Company had two Private Acts—one obtained in 1857 and a subsequent one in 1874. Under their 1857 Act, section 43 dealt with the amount to be charged for water for domestic purposes; section 44, beyond the rates authorized to be taken under the previous section, provided that the Company might demand certain payments in respect of additional water-closets beyond the first, and also for baths, and so on. Section 46 defined "domestic" purposes, which excluded a supply for baths, steam-engines, working machines or apparatus, or for any trade, manufacture, or business whatever. There had been two or three cases on somewhat similar points, in one of which Mr. (now Lord) Justice Buckley gave an elaborate judgment. But in the present case the Company had a special provision in their Acts which, to some extent, distinguished this case from any other previously decided. By section 47 of their Act of 1857, they were required to supply any person with water for other than domestic purposes at such rate as might be mutually agreed upon, or, failing agreement, on such terms as might be determined by any two Justices, provided that the supply for domestic purposes was not in any way interfered with or endangered. This section had never been put into force. The Company said the supply demanded in this case was for other than domestic purposes; and they always claimed that it should be furnished by meter. The issue raised was: Was this a case for domestic supply or a supply by meter? The Company in 1874 obtained another Act, section 22 of which was a rather peculiar one. It provided that no person should be entitled to require, nor should the Company be bound to furnish, a supply of water otherwise than by meter or by special agreement, to any dwelling-house where any part of it was used for any trade or business purpose for which water was required. The plaintiffs said that the housing and maintaining of paupers, though in one sense, no doubt, it would apply to a domestic matter, was a trade or business; and it had been so decided in a great many cases. The most important was that known as the Marylebone case, tried before Mr. Justice Buckley, who held that maintaining and providing for pauper children was a trade.* There was no doubt that in the present case it was a trade for which water was required; and the plaintiffs had all along said that, under these circumstances, and having the section referred to in their Act of Parliament, they were not bound to supply water to the workhouse otherwise than by meter or under special agreement. They admitted that, if there had been no such section, the workhouse might be said to be, in a sense, a dwelling-house; and in many instances it had been held to be so. In the Marylebone case, Mr. Justice Buckley distinguished the various purposes for which the water was used, and said that one was a domestic and another a trade purpose. But the defendants had not put themselves into a position to separate domestic from trade purposes, and therefore were not entitled to a supply for the former.

Justice Jelf asked if it would be possible to divide the supply into two and to deal with them separately.

Mr. Balfour Browne thought that it might be possible, but it would be very difficult. The defendants, however, had not done so, and until they did they were not entitled to ask for a domestic supply. If the decision referred to was a good one, it was a trade purpose for

* See "Journal," Vol. LXXXV., p. 636.

which the water was used in the present case; and therefore the plaintiffs said they were not bound to supply water otherwise than by meter or under an agreement. Anyhow, the defendants had the protection of section 47; and if they thought the Company's charge was unreasonable, they could go before two Justices and have the matter settled. At a certain date the defendants had given up using water for chopping wood; and this looked as if they were trying to divide their uses of the water between trade and domestic purposes. But they were still employing it in a number of ways which were clearly not domestic, apart altogether from the argument that the whole concern was a business or trade. They were using water for two Lancashire boilers, a ventilating-fan, for driving laundry machinery, and in other ways outside the ordinary idea of domestic purposes. In the case of *Pigeon v. Great Yarmouth Water-Works Company**, it had been held that a lodging-house was entitled to a domestic supply, though a business was carried on there; but in that case, the Company had not a section like section 22 of the plaintiffs' Act of 1874. Counsel then referred to other cases bearing upon the question, and reverted to that decided by Mr. Justice Buckley, where it was held that a school was a dwelling-house within the meaning of the Water-Works Clauses Act, and that, though a business was carried on there, the defendants might still be entitled to a supply of water for domestic purposes, though they must first comply with the reasonable regulations which the plaintiffs were entitled to make. He then read, and commented at some length upon, his Lordship's judgment.

Justice JELF said in that case the learned Judge seemed to be of opinion that there might be two separate supplies—one for domestic, and the other for non-domestic purposes; but it appeared to him that there would be very great difficulty in carrying this out.

Mr. BALFOUR BROWNE thought it would be really impracticable. His case was that the defendants were precluded by section 22 of the Company's Act of 1874 from being entitled to a domestic supply at all. In the case before Mr. Justice Buckley, there was no such section as that. Its object was to draw a broad distinction—that if any trade was carried on, an agreement must be made with the Company. There were distinct decisions that the maintaining of paupers was a trade; and therefore the defendants were only entitled to have a supply of water by meter or by agreement.

Justice JELF suggested that, before going into evidence, it would be well for him to hear the defendants' contention.

After some discussion as to the relief for which plaintiffs asked,

Mr. LUSH said he understood the plaintiffs put forward two main points—first, that it was a trade or business which was carried on on the premises in question; and, secondly, that, under section 22 of the Act of 1874, part of the premises were certainly used for trade or business purposes. To take the second point first, and looking carefully at the section, it was not merely because a trade or business was carried on on part of the premises that the prohibition of asking for a domestic supply was imposed; it was only where part was used for a trade or business for which water was required. If, under the pretence of getting a domestic supply, a trader occupied a room or two in the building, but used the other part for the purpose of carrying on a trade requiring water, then, under this section, he could not get a domestic supply. The distinction to be drawn was between requiring water for the inhabitants of a dwelling-house and requiring it for a trade or business purpose. Assuming for the moment—which, of course, he did not admit—that providing for paupers was a trade or business, it was quite consistent that the water for this business was water required for occupancy as a dwelling, and not for business *quâ* business. This was pointed out by Mr. Justice Buckley in the Marylebone case which had been cited. The important point in each case was not the character of the house, but the purpose for which the water was used. The case of a lodging-house was a good illustration of the difference.

Justice JELF said the point to his mind was whether any part of the house was used for a business for which a supply of water was required.

Mr. LUSH did not know in what respect any part of the workhouse was used for a business which required water independently of its occupiers.

Mr. Justice JELF said a goodly list had been given—two Lancashire boilers, a ventilating-fan, and laundry machinery. These were not ordinary domestic purposes.

Mr. LUSH said he did not dispute that there were some purposes for which the water was used which were not domestic. Section 47 spoke of some purposes being non-domestic and of the terms being settled by arrangement. For instance, with regard to the engines, they could, in order to get over the trouble of having separate meters, have a certain scale of charges for engines, charging so much per horse power. They were quite prepared to pay by the horse power for such of the engines as were held to be non-domestic.

Justice JELF said that this would be a compromise; but now that the parties were at law, he should have to deal with the case strictly on the terms of the statute.

Mr. LUSH quite agreed. He said his point was that section 22 carried the plaintiffs no farther. In the Marylebone case, the defendants had refused to comply with the reasonable requirements of the Water Company. In the present instance, there were no such conditions precedent. It was not a case where only a part of the house was used for business. So that section 22 did not really apply. The learned Counsel then referred to the judgment of Mr. Justice Buckley, and read certain passages to show that premises such as those in question were entitled to a domestic supply.

Justice JELF asked Mr. Lush if he was prepared to admit that these premises were carried on for business purposes.

Mr. LUSH said he was not. He was merely assuming it for this part of his argument. Assuming—not conceding—that a business was carried on in part of the workhouse, the purpose for which the water was required was not a trading purpose.

Justice JELF: Not the pumping-engines?

Mr. LUSH said certainly not, if the engines pumped water for the purpose of cleanliness. There were many purposes other than domestic which were not business purposes. The line of demarcation was not between domestic and trading purposes, but between domestic and other than domestic purposes.

Justice JELF said there appeared to be two baskets—one domestic and the other non-domestic. If they were not in the one basket, they must be in the other.

Mr. LUSH argued that if a trade was carried on for which water was required merely because it was a trade, then the supply would not be for a domestic purpose.

Justice JELF: But could you draw the water from one and the same pipe, sometimes to wash your hands and sometimes to set your engine going? If not, you would want two sources of supply.

Mr. LUSH contended that, assuming for the moment that this was a "business" within the meaning of the Special Act, the defendants did not want the water for business apart from the dwelling at all; they required the whole of the water for the occupants of the dwelling-house. Everything depended on the character of the purpose. It might be other than domestic; but it was not a business purpose.

Justice JELF said he could not agree with that.

Mr. LUSH submitted that the cases cited about schools and workhouses were decided under covenants not to carry on a business or suffer the house to be a nuisance, or something of that kind.

Justice JELF pointed out that Mr. Justice Buckley had adopted these decisions.

Mr. LUSH said the Marylebone case was a school for pauper children.

Justice JELF thought it made no difference whether it was a school for teaching pauper children or an institution for looking after old men and women; it was a public purpose.

Mr. LUSH submitted that the Guardians here were only discharging their duty in maintaining the paupers; and this was not correctly classified as a trade or business within the meaning of the section.

Justice JELF suggested that this gave the go-by to the judgment of Mr. Justice Buckley.

Mr. LUSH argued that, apart from the cases cited, the broad principle appeared to be that the domestic supply—namely, that required for the health of the public—was to be the first consideration, apart from trade or business; and that the water was not to be used for the latter purpose so as in any way to endanger the supply for the inhabitants. This principle, he said, applied quite as much to the inhabitants of a workhouse as to anyone else. The Company took up the position that the defendants were not entitled to a domestic supply, because of section 22; also that there was an agreement, and that one side could not break it. In 1901, the defendants told the Company they admitted that certain purposes for which the water was used might be non-domestic, and that they were willing to pay extra for water used for such purposes as might be agreed. But they insisted on the supply being a domestic one at the annual value rate. Learned Counsel then drew attention to the relief applied for in the statement of claim, part of which was an injunction to prevent waste, which he submitted the Company were not entitled to, on the authority of a decision of the Court of Appeal; and, lastly, he pointed out that they asked for a sum of money as damages for the use of water they had voluntarily supplied—a claim which he thought could not be supported.

A plan of the premises was put in, and also the interrogatories and answers, which set out the particular uses of the water which were alleged to be non-domestic, but some of which the defendants contended ought not to be so described.

Mr. RANDOLPH read some of the correspondence, beginning with October, 1876, when the Company informed the Guardians that the charge for water would entirely depend on the quantity consumed. This was accepted by them. In 1901 and 1902, the correspondence dealt with the question now raised; the Guardians having passed a resolution desiring the Company to remove the meter, and supply all water required for domestic purposes at the workhouse according to the annual value, under section 47 of the Act of 1857. The Company insisted on the existing agreement being still in force. It appeared that for the first year for which the Guardians had tendered £12 1s. 3d. the quantity used was 1,288,000 gallons, for which the charge on the meter rate was £40 odd. The figures for the next year were very similar. In a later letter, the plaintiffs called attention to the fittings, and alleged waste of water in connection with the closets. Matters went on; the Guardians sending cheques quarterly, which were returned by the Company. Ultimately, after many letters complaining of the wasteful character of the fittings, with certain letters making offers and counter-offers, which were written "without prejudice," one letter of June 15, 1904, connected with the others, was not so headed; and there was a long discussion as to whether it could be read. His Lordship decided that it could not. On the 6th of July the writ was issued.

Mr. *J. W. M. Richardson*, the Water Engineer of the Birkenhead Corporation, said he examined the fittings at the workhouse, and found that they were not suitable for a supply of water for domestic purposes on the annual value.

Mr. DANCKWERTS objected to this evidence.

Another discussion ensued; and his Lordship's opinion was that the evidence was not admissible.

Mr. RANDOLPH submitted that it was part of his case to show that the defendants were not in a position to claim a domestic supply of water.

Justice JELF said the witness must state the facts he had observed.

The witness then briefly described the mode in which the closets, urinals, &c., were flushed, under which any quantity of water could be used at the discretion of the defendants. He said it would not be easy or economical to have a dual system of mains and services, one for domestic and the other for non-domestic purposes.

Cross-examined: There was no absolute difficulty in having two separate systems, the expense of which, failing agreement, would fall on the consumer. There might also be a meter fixed on every branch pipe used for the non-domestic supply.

Re-examined: At present there was only one set of pipes, and there was no way of distinguishing between the purposes for which the water was used.

The case was then adjourned till next morning, when it was announced that his Lordship was unwell, and the further hearing was accordingly postponed indefinitely.

* See "JOURNAL," Vol. LXXVIII., p. 1390.

Tuesday, Dec. 18.

The case was resumed to-day, when

Mr. BALFOUR BROWNE began by saying he was prepared to prove that the defendants used the Company's water for the gardens.

Mr. DANCKWERTS admitted that a watering can was used, but not a hose.

Justice JELF said he did not think he could draw any legal distinction between the two.

Mr. BALFOUR BROWNE said he could also prove that payments were made to the Guardians by the relatives of some of the inmates of the workhouse.

Mr. *Francis E. Roberts*, the Chairman of the plaintiff Company, was then called, and stated that the firm he was connected with acted as Solicitors for the relatives of a woman named Holly, who resided in the workhouse; and they made a quarterly payment to the Guardians for her maintenance.

Cross-examined: There was a case in which the Company insisted on charging a butcher in Chester at the domestic rate for his shop, though he wanted to be supplied by meter. He used hardly any water at the shop, though his family lived there during the day. His slaughter house, where a good deal of water was used, was supplied by meter. Witness produced the plaintiffs' scale of charges, which stated that no charge was made for baths or water-closets.

Mr. *Bernard W. Bryan*, the Chief Engineer to the South Essex Water Company, said he had recently inspected the water-fittings in the Chester Workhouse. Water was used in connection with the feeding of the pigs, and steam was employed for heating the water with which their food was mixed. It would be impossible to secure that water for domestic supply was not used for trade purposes, and *vice versâ*.

Cross-examined: It would not be practicable economically to have a duplicate supply. The engineering difficulties were simply those of initial expense, which would fall on the defendants. But it would be absolutely impossible to prevent the domestic supply being used for non-domestic purposes.

Mr. *T. B. Farrington*, a water engineer, also gave evidence as to the purposes for which water was used in the workhouse. He could not agree with the evidence of Mr. Bryan as to the impossibility of having a duplicate water supply. It would be no more open to abuse than an ordinary domestic service. Where this occurred, offenders could be prosecuted.

Mr. *Wm. Turnock*, the Clerk to the Guardians, said they received no payments either from paupers or their relatives, except such as could be enforced by law. Water was only used in the mortuary house for cleaning purposes, and in the chapel for cleaning and heating. Down to December, 1901, the defendants had paid for the water by meter. In 1900, a deduction of 10 per cent. was made by the plaintiffs in response to an application—the consumption being over a million gallons. Their payments had averaged about £200 per annum. On Aug. 28, 1901, he sent to the plaintiffs the copy of a resolution passed by the Guardians, asking them to remove the meter and charge by rateable value. On Jan. 1, 1902, he sent a cheque in advance (calculated on the rateable value), which was returned; the plaintiffs insisting on the existing agreement. On Feb. 22, the Secretary of the Company wrote, in reply to a letter from him, that plaintiffs were advised that the agreement to take water by meter was binding; and on March 26 they sent a demand on the meter basis, which he returned. The same thing occurred in July. In November following, he received a letter asking for a payment on account generally. In March, 1903, the plaintiffs wrote complaining of waste of water in the closets. He brought the matter before the Board; and a Special Committee was appointed to inquire into it. Further correspondence ensued, and a deputation was appointed to wait on the Company, which he attended. So far as he remembered, the Company would not make any suggestion as to what should be done. In July, the Secretary wrote referring to an interview he had had with witness on the 9th. His recollection was that at that time the plaintiffs were willing that the matter should stand over until the legal question was settled, on condition that the arrears were paid and payments continued on the meter rate. He telephoned in reply, but could not remember what he said. Another meeting was arranged for Sept. 21, in reference to which Mr. Moss, the Secretary to the Company, wrote on the 28th offering a further reduction of 10 per cent., but still insisting on payment by meter, and again referring to an alteration in the fittings. Down to that time, the plaintiffs had never made any suggestion as to the alterations that they desired. In December, there was another letter referring to the fittings, saying there was a good deal of waste going on. Further correspondence ensued, being taken up in April, 1904, by the plaintiffs' Solicitors; and in June came the letters (without prejudice) about which there was a discussion on the former occasion.

Cross-examined: He collected a considerable sum—probably £250 a year—from the relatives of people in the workhouse. The rate at which they agreed for the water supply was the lowest charged to any one with a discount of 10 per cent. The plaintiffs had offered arbitration, which was declined. Defendants had never, to his knowledge, offered to provide a duplicate supply, or to put in separate meters.

In re-examination, witness said the Company had all along insisted on payment by meter, according to the agreement. He maintained there was no agreement.

John Benyon, who had charge of the whole of the water-fittings at the workhouse, next gave evidence. There was a steam-pipe in connection with the piggeries, which was connected about a year ago for the purpose of boiling water for the pigs' food. He described the various ventilating and drying fans used at the laundry and for other purposes, and the engines employed in connection with them. Rain water was used for washing when available. There were eight trough closets; and each range was separately flushed by a 1½-inch screw-down valve, which no one but himself was allowed to use.

Mr. *Farrington*, recalled, said the fittings were first-class, and in excellent condition. The description of the trough closets as given by Benyon accorded with what he saw. It was not a wasteful method. The daily consumption of water at the workhouse, taken over several years, was from 28 to 38 gallons per head.

Mr. BALFOUR BROWNE: The average consumption in Chester is 35·5 gallons per head.

Witness said in some parts of Chester it was 50 gallons per head; 33 gallons for a workhouse was not at all a large consumption.

Mr. *Rowe Morris*, the Chairman of the Board of Guardians in 1904-5, said he was present at a meeting of the Directors of the Water Company on Sept. 21, 1903. It was an informal meeting, and no minutes were taken. The Guardians asked the Directors to point out any defects they complained of, or to send their Engineer; but they did not do either. There was a subsequent meeting in May, 1904; but again no definite complaint was made as to the fittings.

Mr. DANCKWERTS then addressed his Lordship on the law of the case, as well as on the facts. He said that when the defendants, in 1901, claimed to be supplied on the rateable value for domestic purposes, the question of trade uses never really arose, because the plaintiffs met them *in limine* by the contention that they were not entitled to a supply at all on those terms; so that they never got to close quarters as to what were or were not domestic purposes, or how water used for non-domestic purposes should be paid for. The Company throughout insisted upon the original agreement of 1876 being still in force. This position they continued to hold down to the present time; and he should contend it was still put forward on the pleadings. He then referred to the case of *Metropolitan Water Board v. New River Company* (where the question was whether the New River Company were subject to the 10 per cent. limit of dividend), and cited a passage from Lord Macnaghten's judgment in the House of Lords, to show that Water Company's Acts should be construed strictly against the undertakers, and liberally in favour of the public. One had, he submitted, to look to the purpose to which the water was to be put, not to the character of the premises in which it was used. The first class was domestic purposes, which word had acquired, by decision, a technical meaning; the second, commercial purposes; the third, public purposes; and the fourth, anything not included in the other three. Public purposes were obvious—flushing and cleaning the streets and sewers and extinguishing fires; commercial, anything in the nature of trade; and the fourth class included ornamental purposes and such as had been excluded from the domestic class, such as watering gardens, animals, and, in some cases, swimming baths. There was no definition of domestic purposes except by way of exclusion. In *Bersby v. Chesterfield Water Company*, water used in a stable and coach-house was held to be for domestic purposes. In *Bristol Water Company v. Uren*, it was held that a garden and pleasure ground were properly included in assessing the water-rate, but that a special charge might be made for using a hose. In the Liskeard case, which had been frequently approved, it was held that water could be required to be supplied to a workhouse for domestic purposes, as being a dwelling house. In *Smith v. Miller*, a boiler used to supply hot water to offices was held to be a domestic boiler. In *Pigeon v. Yarmouth Water-Works Company*, it was held that the occupier of a boarding house was entitled to a supply for domestic purposes at the usual rate; the defendants contending that it was required for trade purposes. The learned Counsel, having commented on these cases, went on to deal with that of *Barnard Castle Urban District Council v. Wilson*, where a swimming bath in a school, where swimming was taught and specially charged for, was held not to be within domestic purposes. He suggested that in former times baths of any kind were rare, and probably the clause in some Acts allowing an extra charge for baths was a survival from those early days when baths were looked upon with suspicion. He then took the case before Mr. Justice Buckley of the *South-Western Suburban Water Company v. Marylebone Union*, which he discussed at some length, and had not concluded when the Court rose.

Wednesday, Dec. 19.

On the resumption of the proceedings this morning,

Mr. DANCKWERTS continued his argument, and stated, in answer to a question put by his Lordship the previous day, that he could point out several cases in which water had been supplied for both domestic and non-domestic purposes to the same premises. It was a well-known practice to have two separate supplies, and in other cases it was combined. For instance, the present plaintiffs gave a combined supply to public houses in Chester, charging the domestic rate *plus* 25 per cent. to cover the trade use. Having read a great portion of Mr. Justice Buckley's judgment in the Marylebone case, he cited a number of other cases, including *Cooke v. New River Company*, and then went on to submit that the purposes to which the water was put by the defendants were not in the nature of a business, even if they did not come within the description of domestic. Several cases were referred to in which the word "business" had been held to mean what was done for the purpose of making a profit, and his submission was that neither the laundry nor the piggeries came under that category—they were merely incidental to the proper management of the workhouse. He then went through the Water-Works Clauses Acts and the Company's Acts, and discussed the various provisions therein contained in some detail, for the purpose of showing, among other things, that the Company were adequately protected against waste or misuse of water. A considerable amount of discussion took place on the special clause in the plaintiffs' Act, which provided that no one should be entitled to demand a domestic supply to a house in which, or in any part of which, a trade or business was carried on; Mr. Danckwerts contending that any non-domestic use did not necessarily come within that clause. On the whole, he urged that it would be an intolerable hardship if the Company could refuse a domestic supply under such circumstances when they were amply protected in other ways. He again referred to the plaintiffs' published scale of charges, according to which closets and baths were included in the domestic supply without extra charge. He further submitted that, if necessary, he was entitled to treat different blocks of buildings as separate houses; the piggeries, for instance, could not be treated as part of the house. Having briefly alluded to certain topics which he said had been introduced for the purposes of prejudice—such as the suggestion of arbitration which the plaintiffs themselves had said would not be satisfactory, and that the rateable value was fixed by the guardians themselves—he concluded a long argument by discussing the facts of the case in the light of the propositions he had endeavoured to establish. With regard to the two Lancashire boilers, he contended that they were only partially used for non-domestic purposes. He admitted that the engines were non-domestic; but he denied that the

pigs were kept for sale. With regard to watering the gardens, if they were included in the annual value, they were entitled to use water for them. The Company could, however, charge separately if they preferred, but then the annual value would have to be proportionately reduced. The use of water in the surgery, in the church, and in the mortuary, he submitted could not be treated as other than domestic. After referring to the correspondence between the parties, he submitted that the defendants were entitled to determine the agreement at any time after the first three years, and that the plaintiffs had themselves considered that the whole supply, except that for extinguishing fire, was domestic. Various points on the pleadings were then dealt with; and it was submitted that, under the Statute limiting the liability of guardians of the poor, the plaintiffs could not recover a greater amount than represented nine months' consumption before the writ was issued.

Mr. Balfour Browne then replied. In his view, the case had been overlaid with an immense amount of irrelevant matter and legal decisions which did not affect the question; and he should not refer to them. He repudiated his learned friend's division of the use of water into four categories; the only distinction drawn in the Acts being between domestic and non-domestic. It had been held that a stable was part of a house, and that the whole tenement had to be considered as one, and not as separate buildings. He submitted that practically two supplies were out of the question, though physically such a thing might be possible if expense were no object. He agreed that there might be public institutions that were held to be in the nature of a business which had a domestic supply; but in the present case, section 22 of their Act of 1874 got over that difficulty by saying: "No person shall be entitled to require, nor shall the Company be bound to supply, any dwelling house with water otherwise than by meter or by special agreement, if any part of such dwelling house is used for any trade or business purpose for which water is required." This was a complete answer to the defendants' case. It had been held by Lord Justice Buckley that carrying on a workhouse was a business, and the Company were therefore not bound to supply except by agreement; the consumer being protected by his right to appeal to two Justices as to the reasonableness of the terms. Apart from section 22, he admitted that the plaintiffs could require a supply for domestic purposes. Apart from the maintenance of paupers—which was held to be a business—he had only to show that any trade or business was carried on in any part of the premises to entitle him to take advantage of this section; and the keeping of pigs for sale was ample for the purpose. It was perhaps putting it too high to say that the old agreement was still in force; but he put it upon an implied contract to pay for the water at a reasonable price, and the agreement was evidence of what that reasonable price was. In the same way, he got rid of the point raised about the limit to which they could recover, because he put it as damages for waste of water. He further pointed out that the plaintiffs had never approved of the fittings as being suitable for a domestic supply; and the defendants had therefore never put themselves in a position to require it. The question of the statute of limitations was not of primary importance, the real question being the rights of the parties; and with regard to that, he relied on section 22.

Mr. Randolph having explained his view of the statute of limitations, and why he had included a claim for damages founded on an Irish decision of *Corporation of Dublin v. Dublin Guardians*,

Mr. Lush pointed out that if it were damages for a tort, there was another statute which put a closer limit upon the time than that named by his learned friend.

Justice Jelf said he must consider his judgment.

A Case for an Engineering Expert.

A case recently came before Mr. Justice Channell, among the commercial summonses in the King's Bench Division of the High Court of Justice, which his Lordship confessed he was unable to try, in consequence of its complicated and technical character. It was an action brought by Messrs. Fielding and Platt, of Gloucester, against Messrs. Saxby and Co., of Chippenham, in regard to the sale of certain gas-engines and gas-producing plant for £1350. Mr. Hamilton, K.C., and Mr. Bailache appeared for the plaintiffs; Mr. Scrutton, K.C., and Mr. Leek represented the defendants. Mr. Hamilton stated that the plaintiffs' case was that the plant was duly supplied, and the defendants had paid £1001 5s. 4d., but they declined to pay any more, setting up as their defence that the goods were not delivered within the specified time, that they were not up to the specification, and that some of them were unfit for the purpose for which they were intended. Defendants also set up a counter-claim, alleging that they had sustained damages by reason of the engines not being as they should have been. Counsel said the substantial answer to the claim was the alleged delay, which the plaintiffs admitted up to a certain point only. It was alleged that the gas-engines had not worked satisfactorily, and that the plaintiffs were bound to rectify them. The contract entered into was for the lump sum of £1350; but the defendants said they had incurred £1000 damages, which they claimed, less some £300 due to the plaintiffs under the contract. Plaintiffs had made certain payments into Court, some with and some without a denial of liability. Personally, he did not see how his Lordship could try the question, as it was complicated; and, so far, they had not been able to agree to a reference. Probably, however, his Lordship could try the question as to what the contract was. Plaintiffs alleged, and defendants denied, that by virtue of one of the clauses, which engineers often put into contracts, they would not replace breakages; they were not therefore liable. After hearing the evidence, his Lordship said he could not try the case, and referred it to an engineer.

A portion of the roadway in Cheapside was damaged on Christmas Day by the bursting of a water-main belonging to the Hydraulic Power Company; the water making its way under the asphalte surface, and forcing it bodily upwards. It is stated that it will be necessary to repave the road, as the asphalte coating was forced right away from its concrete bed.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS CONTROVERSY.

The Presidency of the Midland Association.

No reply has yet been received to the Nottingham Corporation's request for the intervention of the Local Government Board in relation to the gas controversy. But in the meantime there have occurred developments significant of petty spite on the part of certain of the Committee responsible for the control of the municipal undertaking. It seems incredible that, in an age when honour to be paid to a responsible official should be regarded logically as an honour also to a corporation, obstacles should be placed in the way of the fulfilment of an arrangement which would cost the ratepayers nothing.

When Mr. J. H. Brown, the City Gas Engineer, was invited in 1905 to undertake the Vice-Presidency of the Midland Association of Gas Managers, the request was brought to the notice of the then Committee, with the result that there was no objection raised. But now the full honour of the higher position in succession to Mr. F. W. Stevenson, of Coventry, has been suggested, the pettyfogging spirit of "How much time will this mean away from Corporation work?" has come into evidence. The upshot is that Mr. Brown has intimated that, under the circumstances, he can neither undertake the office nor proceed with arrangements for welcoming a body of representative men to the city. It must to the credit of the Municipality be recorded, however, that the Committee, in the sense of a majority, were not opposed to an arrangement in relation to an office which probably would not have entailed during the year more than four days of partial absence from official work. Maladroitness is a somewhat heavy word for representing would-be clever tactics; but the design was personal in antagonism to the Engineer, and the failure to permit the carrying out of the arrangement under which the members of the Midland Association were to visit Nottingham this year, exhibits a narrowness of view which, when the whole of the facts underlying the controversy are made public, is not calculated to redound greatly to the credit of individuals who at this juncture need not be specifically named.

PRESENTATION TO MR. ARTHUR ANDREW.

On Friday, the 21st ult., Mr. Arthur Andrew, the General Manager of the Oldham Gas and Water Works, was presented with a handsome solid silver tea service, in recognition of his completion of forty years service with the Corporation. The gift has been subscribed for by his colleagues, and was presented in the Alexander Hall in the presence of a company numbering about 150. Mr. Tim Duxbury, the Gas Engineer to the Corporation, presided.

Mr. Andrew commenced his career as a clerk in the gas and water offices. He was afterwards appointed to more responsible posts, and eventually became the Accountant. In 1894, the position of Superintendent and Secretary was rendered vacant through the death of his brother, Mr. Herbert Andrew, and he succeeded him. Since then Mr. Andrew's official designation has been altered from Superintendent to General Manager. Since his appointment he has seen the departments of which he is the head grow to an enormous extent. In 1866, when he was first employed in the office, the amount of cannel and coal used per annum was 20,000 tons; whereas it is now 120,000 tons. In 1866, the total quantity of gas made was 214 million cubic feet; now it is 1318 millions. The number of gas-meters then was 13,000, against 51,000 to-day; and the quantity of gas supplied to the public lamps was only 21 million cubic feet, compared with 86 millions now used in lighting the borough. In the earlier year named, the price of gas was 3s. 8d. per 1000 cubic feet; now it is only 2s. 2d.

In opening the proceedings, the Chairman said they were assembled to do honour to one of their officials who had served forty years under the Corporation; and, so far as he knew, Mr. Andrew had served them for those forty years conscientiously and faithfully, and had certainly performed his duties creditably and to the best of his ability. It was fully realized that the success of the town depended to a large extent on the ability and integrity of its public officials, who were specially trained for the particular branch of work they had to do. The members of the Council could never be expected to have the technical knowledge of official experts. Oldham was a great and important county borough, and the duties of its public officials were also great and important. Mr. Andrew was an honest, straightforward, conscientious official of the Corporation, and of the Gas and Water Committees in particular. He fought for his own Committees as though fighting for his own interest, and he (Mr. Duxbury) admired him for doing so. Had it not been for him, there would sometimes have been no profit at the end of the year, as other Committees were always ready to appropriate the profits of the Gas Committee; and it was only fair that he should be given credit for having done good work for that Committee. They could not have a better official at the head of the department than Mr. Andrew.

Mr. H. Gartside then made the presentation, for the Presentation Committee, and hoped Mr. Andrew might live long to enjoy it.

Mr. Andrew, in acknowledging the gift, said he was never in a position of greater embarrassment in his life before. He could not see that there were any solid reasons for honouring him. It was true he had had the honour and privilege of serving the Corporation for forty years. But he was not the only one who had done so. The mere fact of having served them for forty years did not, in his opinion, warrant such a demonstration of friendship as the present. He appreciated it more than the intrinsic value of the gifts. He had served the Corporation to the best of his ability; more he could not do. One main reason had contributed to his achieving some measure of success. He

had to serve two Committees who had given him every consideration. Whenever he had made mistakes—and he would not say he had not done so—they had been mistakes of judgment; but he had never had a disagreeable word from the Committees since he began to serve them. They had given him their fullest confidence, and he had appreciated it; and knowing that he had it, and also a measure of responsibility which did not often rest on a public official, it made him work harder in order to deserve that confidence. He must give credit to the staff of which he happened to be the head; for a better or a more hard-working staff there could not be. From the foreman down through every grade, all tried to do their duty. He did not know that, in the course of his long experience, he had ever had a better staff; otherwise his duties would have been much more difficult. He believed some members of the Corporation thought there was a spirit of antagonism between the Gas and Electricity Committees. This was an entirely mistaken idea. There was room for both undertakings; and he hoped the same measure of success would attend the work of the Electricity Committee as had attended that of the Gas Committee. Many members of the Corporation did not realize the magnitude of the gas and water undertakings; but they were spread over an area equal to four times that of the municipal borough they had to supply. In accepting the presents, he again thanked his fellow-employees for them.

Alderman Johnson (the Chairman of the Water Committee) fully endorsed what had been said by the previous speakers in reference to the services of Mr. Andrew. He always admired his business methods, and particularly the carefulness with which he dealt with the finances of the Water Department. He thought a department of such magnitude as the Water Department should be worked on strictly business lines; and Mr. Andrew had always striven to so conduct it, in spite of the criticism to which he had been subjected. He was pleased to see so many present, and he thought it augered well for the success of the department when it possessed such a large and intelligent staff of workmen. He congratulated Mr. Andrew on his faithful services, and hoped they would be long available.

Mr. Thompson, the Vice-Chairman of the Gas Committee (the Chairman having had to leave), expressed his pleasure in testifying to the integrity of Mr. Andrew during the few years he had been connected with the Gas Committee. Mr. Andrew thoroughly understood the work of the department; and this was one reason for its splendid success. In conclusion, he hoped Mr. and Mrs. Andrew would live long to fully enjoy the handsome presents which had been made to them.

The proceedings were enlivened by music, and Mr. Andrew, in moving a vote of thanks to the Chairman and the artistes, thanked the different members of the Gas and Water Committees for their presence, which he took as an honour to himself.

Mr. J. Wild (the Vice-Chairman of the Water Committee) seconded the vote, and paid a tribute to Mr. Andrew, who, he said, had served the Corporation as no other man had done. Labour and capital could work in unison if good feeling and good understanding existed. Mr. Duxbury briefly responded, and the proceedings closed.

PROGRESS OF GAS SUPPLY IN PERTH.

Mr. Thomas Whimster's Work.

Some days ago, the "Dundee Evening Telegraph and Post" published, along with a photo., the following interesting particulars in regard to the work of Mr. Thomas Whimster, who was many years Manager of the Perth Gas-Works.

To the older section of the community of Perth, the figure of Mr. Thomas Whimster, York Place, ex-Gas Manager for the city, is a familiar one. Mr. Whimster is, indeed, one of Perth's grand old men; and he may be seen any day taking his constitutional, his frame still wonderfully erect, despite the burden of 87 years. A native of the Kingdom of Fife, Mr. Whimster was born in Kinghorn in the year 1819; but his youth and early years were spent in Dundee. It was in Perth, however, that Mr. Whimster was to achieve his best work; and his connection with the manufacture of gas in the Fair City was as long as it was honourable. Mr. Whimster was born before the streets of the ancient capital of Scotland were lit by gas. It was not until 1824—five years after the birth of the subject of our sketch—that a Company was formed for the supply of gas in Perth by the late Mr. George Gray, of Bowerswell, a gentleman who acted as Secretary until the undertaking was purchased by the Gas Commission in 1871. If the quality of gas in the country, as is sometimes alleged, has decreased with the passing of the years, so also has the price. In 1827-8, the price charged for gas in Perth was 12s. 6d. per 1000 cubic feet, and when Mr. Whimster came to Perth, it was 7s. 6d. per 1000 cubic feet; while this year the same quantity can be secured for 2s. 9d. In the early days of gas manufacture, however, better coal was used; and 30 candles was the average illuminating power of the gas of that period. No enrichment was resorted to; hence the greater purity and quality of the gas. In fact, Perth was for years noted for the high illuminating power and purity of its gas; and the Fair City was even visited by parties about to construct works in other towns.

When Mr. Whimster first of all came to Perth, there were two Gas Companies; and they each made about 12 million cubic feet of gas a year. But when Mr. Whimster retired in 1895, 124 million cubic feet a year was manufactured. Mr. Whimster, during his long connection with the manufacture of Perth gas, saw many important improvements effected in the works. Under his careful management, a great improvement was made in the reduction of gas unaccounted for or set down as "leakage." The steps leading up to the Town Council erecting new and more spacious gas-works at the Friarton are well known to the inhabitants of the Fair City. As far back as 1881, and again in 1884, Mr. Whimster reported on the dangerous condition of the gas-works and the inadequacy of the supply. In 1895, after a continuous service of about 45 years, Mr. Whimster retired from the gas managership; and on that occasion, appropriate and fitting testimony was paid to his sterling character, his capacity as a gas manager, and the painstaking and thorough manner in which he performed his duties. Again at the opening of the new gas-works at the Friarton, erected at a cost of something like £45,000, the Corporation showed their appreciation of Mr. Whimster's long services by presenting him with a silver salver, bearing a suitable inscription. A keen student of passing events, and singularly alert mentally for his years, Mr. Whimster continues to take a lively interest in the welfare of the community. In politics, he is a keen Radical, and was a great admirer of the late Sir John Leng. That Mr. Whimster may yet have many years to enjoy his well-earned retirement, is the hope of numerous admirers.

SERIOUS FIRE AT MILTON HOUSE WORKS, EDINBURGH.

On Saturday, the 22nd ult., between nine and ten o'clock in the morning, a fire broke out on the premises of Messrs. James Milne and Son, Limited, Milton House Works, Edinburgh, which resulted in the total destruction of the portion of the buildings devoted to the brass-finishing and art-metal work and the metal store—roughly about one-third of the entire establishment, and employing about 200 of the 600 or 700 hands in the service of the firm. The works cover about three acres of ground, in the shape of a rough triangle; and the buildings burnt out formed a large block running from the centre of the area to the south-west side of the triangle. Between the brass-finishing works and the back of the west side of the Milton Street houses lies another block of about equal size, consisting of general warehouses and the gas-meter department; but in the fortunate absence of wind, the outbreak did not threaten the adjacent buildings, and was no source of danger to the neighbourhood. While thus fortunately confined to the building in which it originated, the fire was not without danger to life; and four girls, who first became aware of the occurrence, had what seems to have been a narrow escape of serious consequences. It is supposed that the fire broke out in the tool-shop, at the bottom corner of the building, which consisted of a main lower floor and galleries. The four girls, who were employed during the men's breakfast hour in the lacquering-shop on the gallery above the tool-house, became alarmed at a smell of fire; and noticing that the flooring beneath their feet was burning, they made a rush for safety, and were quickly got out of harm's way. The timekeeper sounded the alarm whistle, and three of the Directors (Messrs. Macfie, Lumsden, and Oliver) happening to be in the offices adjoining, the fire-extinguishing apparatus on the works was started in a few minutes. The alarm was communicated to the fire station, and this quickly brought a detachment of firemen on the scene. It was evident that the brass-finishing department was doomed. As the outbreak subsided almost as quickly as it began, the workmen returned from breakfast to find only blackened walls in place of the building they had left in apparent safety not an hour before. The extent of the damage is very considerable; but it is stated to be entirely covered by insurance. The firm has been in existence since 1750, and this is only the second large fire in its history. It will be seen from an announcement which appears elsewhere that the fire was confined to the brass-finishing department; so that the other departments are in full operation.

GAS SUPPLY IN THE UNITED STATES.

In the "JOURNAL" for the 3rd of July last, we gave some statistics relating to gas manufacture in the United States, extracted from a document which had recently been issued by the Census Bureau. The figures related to the year ending Dec. 31, 1904, and they were admittedly preliminary. The Official Bulletin has since been published, and the following additional particulars have been taken from it by our contemporary "Progressive Age."

		Quantity.		Value.
Materials used—				
Coal	tons	4,431,774	..	$14,607,485
Oil	gallons	403,263,738	..	14,539,585
Water	,,	5,430,361,158	..	253,895
Coke	tons	435,534	..	1,602,761
All other materials		..	..	6,176,340
Total			..	$37,180,066
Products—				
Coal gas, straight	cub. ft.	12,674,033,691	..	$12,868,604
Water gas, straight	,,	715,550,006	..	832,440
,, carburetted	,,	54,687,118,030	..	48,071,180
Coal gas and water gas mixed	,,	40,980,413,950	..	45,605,263
Oil gas	,,	3,397,456,873	..	5,141,460
Acetylene	,,	7,880,666	..	104,267
All other gas	,,	24,329,932	..	39,354
Total		112,486,783,148	..	$112,662,568
Coke-oven gas sold	cub. ft.	3,882,800,400	..	684,464
Gas-works coke	bushels	89,146,434	..	5,195,461
,, ,, tar	gallons	67,515,421	..	2,064,343
All other products		..	..	972,992
Receipts from appliances		..	..	4,249,581
Management—				
Number of establishments reporting		1019	..	..
Capital		..	..	$725,035,204
Salaried officials, clerks		9,406	..	8,463,699
Wage earners		30,566	..	17,057,917
Miscellaneous expenses		..	..	20,557,273
Value of products		..	..	125,144,945

Of the residuals consumed in the works where produced, there were 46,561,185 bushels of coke, 14,772,378 gallons of tar, and 1,363,756,761 cubic feet of gas. Of coke, the beehive ovens produced 22,522,152 short tons and the bye-products ovens 2,216,783 short tons; while from both together were recovered 23,074,225 gallons of tar, 26,050,713 lbs.

of sulphate of ammonia, and 4,339,679 gallons of ammoniacal liquor. Of the bye-products coke-oven gas sold, 3,747,408,300 cubic feet of it was for illuminating purposes and 135,392,100 cubic feet for fuel.

In the portion of the document dealing with gas machines and meters, 89 establishments reported $5,601,157 of capital, 345 salaried employees, 2674 workmen, $557,635 as miscellaneous expenses, $2,612,907 as cost of material, and $5,630,975 as the value of the products. The gas and lamp fittings makers reported 263 establishments, $20,206,957 of capital, 1239 salaried officials, 8141 wage earners, and $2,129,315 of miscellaneous expenses, materials costing $7,395,207, and products valued at $17,560,386. There were 66,882,962 barrels (42 gallons) of crude petroleum refined, producing 26,897,984 barrels (50 gallons) of illuminating oils, 7,281,584 barrels of fuel oils, 2,514,198 barrels of residuum, and 5,811,289 barrels of naphtha and gasoline. The coal-tar distillery products amounted to $340,641, from which $504,176 worth of products were made. Of crude wood alcohol, there were 6,684,871 gallons made, valued at $2,161,813.

LINCOLN WATER SUPPLY.

Great satisfaction has been caused in Lincoln at the receipt of a favourable report from Professor Hull with regard to the Boultham deep bore. It will be remembered that a short time since it was feared, owing to the analyses of the water from the bore, that its hardness and the excessive proportion of salts would render it unsuitable for drinking purposes, unless it underwent expensive treatment.

The bore has already reached a depth of 2015 feet; and in his latest report, Professor Hull (who has acted as the Corporation's Geological Adviser) says he agrees with Mr. Percy Griffith, the Engineer, in thinking that the bore should be carried further down into the sandstone, in which case it may happen that a similar conglomerate to that at Gainsborough may be proved, with the result of bringing an accession of fresh water. The contract for the boring is for a depth of 2200 feet; so that there is an additional depth of 185 feet remaining unproved. It is, he thinks, very desirable that this rock should be penetrated. Only one danger is to be avoided—that of passing out of the new red sandstone into the permian. The specimens brought up will therefore require examination from time to time in order to avoid this danger. In conclusion, he observes, as a source of confidence, that, as the impure waters are being drawn out from the boring at Boultham, they are being replaced by purer waters flowing in from the west. He considers that all underground waters drawn from beyond the valley of the Trent are, in the ordinary sense, fresh; while the objectionable salinity gradually augments in an eastwardly direction. Withdrawal of the saline waters necessarily causes an advance of the purer, owing to the eastward dip of the strata and the hydrostatic pressure. It is this conclusion, which seems to him absolute, that should, he urges, give confidence in the ultimate success of the operations.

The Water Committee have decided to request Professor Hull to meet them as early as possible to consider the whole question, and decide what the depth of the bore shall be.

Canterbury and Incandescent Gas Lighting.

Referring to public lighting matters, Mr. Dean informed the General Purposes Committee of the Canterbury City Council that he had approached the Gas and Water Company in regard to the lighting of certain streets where gas was still in use for this purpose. He had ascertained that the Company were willing to convert the existing gas-lamps of the city into incandescent lamps at their own expense, if the Council would give them an undertaking that they should remain for a period of not less than three years. The Company, of course, would be repaid by the smaller consumption of gas. He had a number of facts to lay before the Lighting Committee at their next meeting; and he asked that in the meantime the Engineer of the electric light works should be instructed not to make any further purchases of cable. The Chairman of the Lighting Committee (Alderman Mason) remarked that, so far as the buying of cable was concerned, they had studiously avoided making any purchases while the price of copper was so high. He wished to say, further, that any offer on the part of the Gas Company must be received from the Company themselves, and not through any individual member of the Corporation. Any recommendations which might reach them in this manner they would be most pleased to consider. Alderman Hart stated that this was the first time that he had heard anything on the subject. Seeing, however, that a new agreement for public lighting must shortly be entered into, he thought there was no reason why the question should not be considered; and he would suggest that the Directors should be asked to arrange for something of the kind. Mr. Godden said they were all prepared to accept any statement which Mr. Dean might put before them, and to consider it carefully; but he would want some strong arguments to induce him to hand over their business to another competing authority. The matter then dropped.

Bilston Gas Company.—In the report which the Directors of this Company will present at the annual general meeting next Monday, they state that the profit and loss account, after paying the usual interim dividends, shows a credit balance of £6373. It is proposed to pay further dividends of 5s. 6d. each on the "A" shares, and 4s. each on the "B" shares (making, with the interim dividends, 11s. and 8s. per share respectively for the year), and to carry forward the balance of £3688. The Directors express deep regret at reporting the loss the Company have sustained by the death of Mr. Joseph S. Reeves, who had been in their service for 43 years, during 33 of which he was Secretary and Manager, in which position he gained the respect and esteem of all with whom he came in contact. The Directors announced the appointment of Mr. W. H. Adams, late Manager of the Gosport Gas Company, as Engineer and Manager, and Mr. A. Bradford Legg, as Secretary, *pro tem.*

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

As usual, I preface my last "Notes" for the year by a few reminiscences regarding the doings which have come under review. There is nothing very outstanding to narrate. The year has been one of steady work, with the normal advance quite sustained, and, fortunately, without any disaster, financial or otherwise. In nearly every instance the financial year ended with a positive improvement in the matter of output of gas, though in some cases the revenue was down, owing to reductions in price. Thus, it may be noted, the increased output at Aberdeen was nearly 26 million cubic feet; at Alloa, nearly 8 millions; at Arbroath, 3½ millions; at Coatbridge, nearly 12 millions; at Dundee, 42 millions; at Dunfermline, 5 millions; at Edinburgh, over 8 millions; at Falkirk, over 20 millions; at Glasgow, over 255 millions; at Hamilton, 8½ millions; at Greenock, over 26 millions; at Kilmarnock, 1½ millions; at Kirkcaldy, nearly 5 millions; at Paisley, 14½ millions; and at Stirling, nearly 7 millions. Reductions in price were pretty general during the year; quite a common feature being that, while the price remained stationary to ordinary consumers, reductions were made to users for power, cooking, and heating purposes. The principle of charging differential prices for gas has thus obtained a much wider adoption than it had before. Of about 245 gas undertakings in Scotland, 64 charge lower prices for these purposes; while a number of others give discounts to large consumers, which is another form of the differential rate. Thus nearly a third of the undertakings are working under the differential principle, by which large proportion the success, or otherwise, of the system should be well tested.

Reductions in illuminating power have been made in more than one place, notably in Edinburgh, where the Gas Commissioners have sanctioned experiments being made with gas of as nearly as possible 20-candle power—the statutory minimum; the former standard having been from 24 to 26 candles. This movement seems to be giving the death-blow to schemes for enrichment, which are seldom heard of now. Though undoubtedly there are oil gas and benzol processes operating in a number of gas-works, little is said about them, from which the inference may be drawn that they are not holding their own in the race. The cheapening of gas has already had the effect of checking the inflow of electricity, as instances of which may be mentioned the two circumstances that in Coatbridge the Corporation gave up the partial lighting of the streets by electricity, and reverted to gas, supplied by the Coatbridge Gas Company; and that there were no registrations of any new companies for the supply of electricity for lighting purposes. Four companies supplying gas were registered, all of them small. If companies are too prosperous to feel the necessity for placing themselves under the Companies' Acts, the measure of prosperity which is attending the management of corporation undertakings has led to an extension of the practice of appropriating gas surplus revenues for town purposes. Hitherto the Corporations of Paisley and Arbroath have been the only municipalities in Scotland to follow this practice—a questionable one at the best; but this year the Corporation of Greenock voted £1700 of gas surplus to the general purposes of the burgh, and the Corporation of Perth obtained legislative power to so appropriate £250 a year.

New gas-works were opened at Edinburgh in October, at Gourock in March, at Falkirk in May, and at Kelty in February; and gas-works were very largely reconstructed at Airdrie, Newton-on-Ayr, East Wemyss and Buckhaven, and Campbeltown. At present, new works, for a recently started Company, are being erected at Polmont.

In May, the transfer of the Grangemouth Gas Company's undertaking to the Corporation was accomplished. In Lanark, negotiations for transfer have been interrupted by the death of Mr. J. M'Gilchrist, who was the Adviser of the Company. The Town Council have procured a report upon, and valuation of, the undertaking from Mr. W. R. Herring, of Edinburgh, and have agreed to postpone further negotiations to allow the Gas Company to consult an expert. At Sanquhar, a transfer has been effected; but as the ratepayers have yet to be consulted, a firm of Law Agents have, at the request of the Town Council, taken interim possession. Notice of motion has been given in the Lochgelly Town Council for consideration of a proposed transfer of the undertaking of the recently formed Gas Company there. The Town Council of Fraserburgh have had circulated among them for consideration a report by the Town Clerk upon the subject of a transfer there. A Committee of the Selkirk Town Council have been appointed to confer with the Directors of the Gas Company with a view to a transfer. Proposals for transfers were rejected, on polls being taken, by the ratepayers of Barrhead and Dunblane.

A question as to the legality of the purchase of coke from the gas-works by two members of the Corporation was raised in the Paisley Town Council. The opinion of the Lord Advocate for Scotland was taken upon it, as a result of which one of the Magistrates implicated resigned his seat in the Council, and the other was unseated by vote of the Council. The question was then raised in the Town Council of Glasgow; and a ruling was obtained from the Town Clerk, which was to the effect that the purchase of coke by a member for his own purposes, at market prices, would not be illegal, but that it was safer not to purchase, except from a coal merchant in the open market.

Of litigations relating to gas-works, the most important has been that with reference to the pollution of a brewery well in Edinburgh, which is making but slow progress, and is still apparently far from being concluded. There was another litigation, in the Sheriff Court at Hamilton, in which the question was as to the right to cut off the gas supply of a consumer who complained of an overcharge; and it was decided entirely in favour of the gas undertaking. In the Glasgow Sheriff Court this week, Sheriff-Substitute Fyfe declined to interdict the Corporation from cutting off the supply of gas and electricity to premises owned by a Company who were in arrears with their payments. The Sheriff proceeded upon the view that the Corporation had statutory powers to cut off, and could not be interdicted.

During the year, very successful exhibitions of gas appliances on a large scale were held at Aberdeen and Dundee.

New appointments were made as follows: Mr. John M'Gilchrist, to

Gourock; Mr. J. D. Keillor, to Lochgelly; Mr. John Ireland, to Tayport; Mr. A. Lobban, to Auchterarder; Mr. J. G. M'Geachin, to Dumbarton; Mr. W. Ritchie, to Peterhead; Mr. G. Keillor, of Musselburgh, to Comrie; Mr. J. Dickson, to Kelty; Mr. T. Watson, to Girvan; and Mr. J. Campbell, to Polmont.

The obituary contains the names of Mr. S. Stewart, late of Greenock; Mr. J. M'Gilchrist, of Dumbarton; Mr. A. D. Robertson, of Oban; Mr. J. Hall, of St. Andrews; and Mr. J. B. Terrace, formerly of Brechin.

The opinion I expressed last year, that there was every appearance of coal rising in price, has been confirmed. As compared with the prices ruling a year ago, there is an increase, all over, of about 2s. per ton. The increases in price, however, were very slight till after the middle of the year, by which time most of the coal for gas undertakings, including all the principal ones, had been contracted for, and in such cases coal supplies for the year have only been advanced by from 1d. to 6d. per ton; the average advance being about 3d. As it has been agreed that the miners are to receive an advance in wages equal to 6¼ per cent., it is probable that there will be another rise in the prices of coal in 1907. Gas oils are reported to have advanced during the year by about 5s. per ton.

This completes my observations as to gas affairs in Scotland in 1906. The year will not be a memorable one, either in the matter of good report or ill report; but these "Notes" which I have written indicate a still rising tide. To use another metaphor, the barometric reading of all reliable returns is in the upward direction; and the feature upon which we ought all to congratulate ourselves is that the upward movement is so steady, on account of its giving ground for the expectation that, being steady, it will also be permanent.

The Gas Commissioners of the Edinburgh and Leith Corporations on Monday instructed that, in view of questions which have been raised by the Corporation of Edinburgh as to the testing of gas, excerpts from the Edinburgh Corporation expert's report should be printed and circulated among the members for their consideration. The Commissioners remitted to Committees to consider the notices which have been given of applications for statutory powers, in so far as they affect their interests. One of these was mentioned by Mr. Herring, the Engineer, as affecting the Commissioners' interests very seriously. It is an application for power to run an electric tramway between Edinburgh and Dalkeith; and it was stated that, in parts of the route which is proposed, there are as many as five lines of pipes, and in one place two trunk mains. Mr. Herring urged that it was most important that they should have their pipes protected from injury, as well as that they should have access to them, at any time, for repair. A letter from the Town Clerk of Edinburgh was submitted, in which it was pointed out that the Commissioners' Act of Parliament of 1888 provided for the appointment of a testing place or places, and the question was put whether the Commissioners had, by minute, either before or after the opening of the Granton works, fixed a gas-testing place under the statute. If so, he would be obliged if the Commissioners would send him an excerpt of that minute. Mr. Herring explained that, originally, the testing-places were minuted as the gas-works in Leith and the office of the Commissioners in Waterloo Place. He thought it was in 1899 that they adopted as a testing-place the Edinburgh works, instead of Waterloo Place. Then, when the Edinburgh works were closed, as a natural consequence, the testing-place was established at the Granton works. The Clerk was instructed to ascertain if there were a minute upon the subject, and to let the Town Clerk have the information he desired.

In the Glasgow Sheriff Court on Monday, Sheriff-Substitute Fyfe heard parties in a petition by the Liquidator of Thomas's, Limited, of Glasgow, to have the Corporation of Glasgow interdicted from cutting off the gas and electricity supply from the premises of the Company; this action having been threatened because of the non-payment of an account incurred previous to the appointment of the Liquidator. For the Liquidator, it was contended that the Corporation were only entitled to a preference over the other creditors. He was quite prepared to undertake that the supplies of power and lighting provided after his appointment would be paid for. The Liquidator, it was claimed, was in the same position as a new occupier of premises, and was, by the Companies Act of 1862, in a better position than a bankrupt. For the Corporation, it was argued that, by their Act of 1869, they had power to cut off the supply of gas to any persons who failed to pay their accounts. The word "person" included the liquidator of a company. It had been judicially determined that a liquidator was only an agent. The Sheriff said that the Corporation had a statutory power, and he was of opinion that a liquidator was not in the position of a new tenant. He therefore refused interdict.

In the Sheriff Small Debt Court at Hamilton last week, John Ramsay, a plumber, sued the Corporation of Hamilton for damages in respect of his gas supply having been cut off because of his non-payment of the quarterly account for gas due in September. The gas supply, the pursuer contended, ought not to have been cut off, in respect that the Corporation had in their possession a deposit by him, which was more than sufficient to pay the account rendered. The account, he also said, was not rendered till the 24th of November, and he was entitled to a month's credit after that date. The Corporation claimed payment of an account for supplies over and above the gas consumed. Evidence was led, from which it appeared that Ramsay had called a meeting of his creditors, and that, on the day following, having met an employee of the Gas Department on his way to cut off the gas, he went to the Burgh Chamberlain's Office and asked for his accounts. These could not then be produced, and he promised to return the following day. The next day was a Saturday, and he said he was detained at work till after the Chamberlain's Office was closed, and could not, therefore, attend. On the Monday, he had another engagement, and could not go to the Chamberlain's Office. The gas was cut off that forenoon. The Sheriff-Substitute dismissed the claim for damages, and found for the Corporation, with modifications in respect of the deposit and of part of the account for gas being incurred prior to Ramsay's entry into his present house.

On Tuesday, there was a violent explosion of gas in a dwelling-house in Brown's Close, Bridgeton, Kirkcaldy, occupied by a Mrs. Stirling. The woman had been searching with a light for an escape of gas in a passage. A good deal of damage was done; one of the walls of the house having been partly blown out, and the ceiling broken in several places. The windows were also smashed. Mrs. Stirling and a grandchild who was with her in the house escaped with slight burns on their faces and hands.

On Wednesday evening, an unmarried woman named Ann Low was found lying dead in her house in Ladyloan, Arbroath. She had not been seen during the day, and the police, on being informed of her disappearance, had the door of the house forced. The gas was found to have been turned on; but there was no gas escaping into the house at the time—the gas-meter having apparently been frozen. Death was, however, certified as having been due to asphyxiation by coal gas.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Dec.* 29.

The week has been much broken by holidays, and the business done has only been on a very limited scale. Contracts for the month being practically covered, buyers have been scarce; while makers whose stocks are not inconvenient have been inclined to wait for the light of another year for the chance of some improvement in values. Meantime the nearest quotations are £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. to £11 15s. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. There has been nothing doing in the forward position.

Nitrate of Soda.

This article has also been quiet, though with a firmer tone for forward delivery. Spot prices are 11s. 3d. per cwt. for 95 per cent., and 11s. 10½d. per cwt. for refined quality.

Tar Products. LONDON, *Dec.* 29.

Owing to the holidays, there has been very little doing during the past week, and it is not probable that we shall see any great alterations until after the New Year. Pitch is very weak; and manufacturers do not appear to have entirely cleared out the quantities which they wish to dispose of for delivery over the first few months of the year. Some quantity of London pitch was sold for prompt delivery at 25s.; while on the east coast 24s. 6d. has been accepted in more than one instance for January-February delivery. In the west, manufacturers report having endeavoured to sell at 24s. 6d. Liverpool for prompt delivery without success; while business has been done in South Wales at prices which will not leave more than 24s. to 25s. at places on the West Coast, according to the freight which has to be paid. There is little business doing on the Continent, where consumers appear to be willing to purchase only for delivery over the last three or four months of 1907. Creosote is very firm. It is reported that some quantity of London oil was sold at 2d. per gallon; but the large manufacturers will not look at anything like this figure. In fact, second-hand oil is selling at 2⅛d.; while makers themselves do not care to entertain business at under 2¼d. to 2⅜d. In the Midlands, there is very little to spare, and makers do not seem at all anxious to sell. In the North, some quantity of oil is reported to have been sold at 1⅞d.; but most of the makers are asking 2d. per gallon, and will only offer small quantities even at this figure. Carbolic acid remains steady. Continental consumers refuse to pay more than 1s. 8½d. for prompt; but manufacturers are well sold, and appear quite willing to stand out of the market until prices improve. In crystals, no business of importance is reported, but small quantities are sold from time to time at the market price. Benzol 90 per cent. is very firm in London; and for prompt delivery this article is very difficult to obtain. In the North, manufacturers are evidently fairly well sold, and will not entertain business except at very good figures. There is no alteration in 50-90 per cent.; and prices remain unchanged. In toluol there is no change in the price of ordinary 90 per cent., but purchases of pure are reported at advancing rates. Solvent naphtha is still very firm. London manufacturers are well sold, and do not seem inclined to consider any further business just at present; while 1s. 3d. per gallon is again reported to have been paid for January-June upon the east coast.

The average values during the week were: Tar, 14s. to 18s. Pitch, London, 25s. to 25s. 6d.; east coast, 24s. 6d. to 25s.; west coast, 24s. to 25s. Benzol, 90 per cent., 1s. to 1s. 1d.; 50-90 per cent., 11½d. to 1s. 0⅛d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5¼d.; solvent naphtha, 1s. 3d. to 1s. 5d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2⅛d. to 2¼d.; North, 1⅞d. to 2d. Heavy oils, 2¼d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8¾d. to 1s. 9d. Naphthalene, £4 10s. to £9 10s.; salts, 33s. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market closes quiet, and there is very little business doing. The principal Gas Companies maintain their quotation of £12 5s. on Beckton terms; but business has been done in ordinary London make at equal to £11 10s. In Hull, business is reported to have been done at £11 12s. 6d.; while £11 15s. was offered for a very fine make, but the manufacturer refused this bid. In Liverpool, business is reported at £11 13s. 9d. to £11 15s.; while in Leith, the value may be taken as £11 17s. 6d. to £12, though no business is reported to have been done. For forward delivery the market is firm; but manufacturers at present refuse to consider the prices offered by dealers.

Electric Light Failure at Cardiff.—The electric light seems to have a weakness for going out just when shopkeepers are particularly busy. The latest instance of this peculiarity has been furnished at Cardiff, where, in certain districts, there were failures on Christmas Eve. Naturally the breakdown occasioned considerable inconvenience; and we are told that the tradespeople of the locality were the objects of much sympathy. This, however, must be poor consolation for such an interference with their business on what is, perhaps, the busiest day of the whole year.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The sudden change in the weather has given an impetus to the coal trade, especially in house qualities. It has also made an impression on gas coal and cannel, by greatly increasing the demand. Miners wages having been raised 5 per cent., coal prices are being increased to-day 5d. per ton in the Manchester district, and something like double that amount outside. During the year just closed, the total tonnage of coal which has left the Manchester Ship Canal reaches at least 620,000 tons. Lancashire, Yorkshire, Nottinghamshire, and Derbyshire collieries have participated in this large export trade. On the whole, the trade in coal from this part of the country for the past year has been greater in volume than ever before; and the prospects, so far as can be seen, are of a most satisfactory character.

Northern Coal Trade.

There has been a very keen demand for coals in the last few days; and the production has been greatly lessened by the holidays—the number of miners at work being much below the usual. In the steam coal trade, the price has been irregular, because the limited supply was mainly taken up by contract quantities, and any small lots commanded high values. Best Northumbrian steams were quoted from 12s. 6d. to 12s. 9d. per ton f.o.b., where early delivery could be given, second-class steams were 11s. to 11s. 3d., and steam smalls from about 7s. to 8s. The prices are, however, ruled by the time of delivery, and vary rather more than usual. Gas coal is at the height of the demand, and the deliveries have been fair under the circumstances for the long contracts; but any available lots beyond these commanded high prices. Durham gas coals vary from about 10s. to 11s. 3d. per ton f.o.b. generally; but for some special kinds, up to 12s. has been asked. Some small lots of coal have been contracted for at near the current values; and a large Danish contract is under negotiation, but nothing is known yet as to the prices that may rule. Coke is scarce and firm. This favourably influences gas coke, which is plentiful, and is now quoted at about 13s. 6d. per ton f.o.b. in the Tyne for good descriptions.

Scotch Coal Trade.

Trade closed for the year in the same active condition in which it has been for the past two months. In addition to commercial purposes, the cold weather made a great demand arise for household requirements. Prices are still tending upwards; the quotations last week having been: Ell 10s. 3d. to 11s. 6d. per ton f.o.b., splint 11s. 6d. to 11s. 9d., and steam 10s. to 10s. 3d. The shipments for the week amounted to 292,621 tons—an increase of 36,144 tons upon the preceding week, and of 13,246 tons upon the same week of last year. For the year to last week, the total shipments were 13,648,463 tons—an increase of 1,396,304 tons upon the corresponding period.

Messrs. John Wright and Co. have fitted up the following places of worship at Newport (Mon.) with their gas-heated radiators: St. Matthew's Church, Mount Zion Chapel, the Presbyterian Chapel, and the Jewish Synagogue; also St. Mary's Church, Cwmbran.

Charge to Prepayment Consumers at Lancaster.

In a report submitted to the last meeting of the Lancaster Town Council, the Gas Manager (Mr. C. Armitage) showed that to fix a uniform rate, and supply 30 cubic feet for 1d. to all prepayment customers, would make a reduction of £521 per annum. This arrangement would then entitle all prepayment consumers to have a cooker supplied and fixed free. The extra price charged for prepayment consumers should, he said, be sufficient to cover the extra cost of meter and cooker fixed complete, and of collection of money, and also to obviate the desire of consumers by ordinary meters to change to prepayment meters, as this would necessitate the purchase of extra prepayment meters and throw a corresponding number of ordinary ones idle. The present difference in the charge does not deter some consumers from changing an ordinary for a prepayment meter; and there appears to be already a growing tendency in this direction. The primary object in introducing the prepayment meter, however, was to reach a certain class of customer, and not to change from quarterly accounts to the prepayment system. Each penny reduction per 1000 cubic feet to ordinary consumers would be equal to £600 per annum. The estimated surplus profit for the current year is £2926; and the amount promised in aid of the rates is £2000. The Gas Committee stated that, on receipt of the report, it was resolved that the amount of gas supplied to consumers by prepayment meters be increased from 25 to 30 feet for 1d., such charge to include the cost of a cooker. Also that the question as to the charge to be made for gas supplied to ordinary consumers be deferred until the estimates for next year are considered. On the suggestion of the Finance Committee, however, the Council agreed to defer for another month consideration of the Gas Committee's resolution as to the price to be charged to the prepayment consumers.

Further Money Required at Brighouse.—The Brighouse Town Council have resolved that application be made to the Local Government Board for power to borrow £15,000 for the Gas Department, divided as follows: £6000 as additional working capital, £4000 for gas-stoves, &c., out on hire, and £5000 for penny-in-the-slot gas-meters. Alderman Healey, the Chairman of the Gas Committee, in moving the resolution to this effect, explained that for some time they had been working without the necessary capital, with the result that they had had a large bank overdraft, for which it was necessary to pay interest. They believed they could save considerably by borrowing the money, and paying annual instalments of principal and interest combined.

Gas-Stoves on Walls.—"Hang the gas-stove on the wall." This, according to the "Ironmongers' Chronicle," is the new principle adopted by an ingenious German professor in the stove he has recently put on the market. Our contemporary says it may be described as consisting essentially of a burner heating a number of tubes through which the air flows—entering them cold, and passing swiftly into the general atmosphere of the room at a high temperature. The burner and the tubes are concealed in an ornamental casing open at the foot, from which depends a reflector to throw the radiant heat of the burner into the room. The air to be warmed flows up behind this reflector and round the back part of the casing before passing through the heating-tubes, so that there is no risk of burning the wall.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
245,112	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6¼—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5¾	..	5 1 10
50,000	10	Aug. 30	14	Bourne-mouth Gas & Water } 10 p.c.	28—29	..	4 16 7
51,810	10	,,	7	B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9½	Do. New	200—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
706,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	230—235	..	4 15 8
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	41—43	..	4 13 0
104,000	Stk.	Aug 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9½—10	..	4 10 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	'	5	Do. 3½ p.c. do.	107—110	..	4 10 11
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas-light and Coke } 4 p.c. Ord.	98½—99½	..	4 8 5
2,600,000	,,	,,	3½	3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 13	3	3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	177—180	..	4 8 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5
561,000	Stk.	Aug. 30	10	Liverpool United A	229—231	..	4 6 7
718,100	,,	,,	7	Do. B	167½—165½	−½	4 3 1
144,140	Stk.	Sept. 13	7⅝	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¼	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	111½—112½	..	4 2 3
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—99	..	3 10 8
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13¾—14½	..	4 16 7
300,000	Stk.	Nov. 29	⅝	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	5¼—6¾	..	5 12 0
398,490	5	Oct. 26	7	Primitiva Ord.	7¾—7¼	−¼	4 10 4
796,980	5	July 27	5	Do. 5 p.c. Pref.	5¾—5¾	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13¾—13¾	..	5 16 5
70,000	50	July 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	246—248	..	4 0 8
209,984	,,	,,	10	Do. B	246—248	..	4 0 8
523,500	,,	,,	10	Do. C	246—248	..	4 0 8
70,000	10	Oct. 26	10	South African	15¾—16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85—87	..	3 9 0
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	156—158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	Nov. 14	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Aug. 30	6⅔	Tottenham and Edmonton } A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	B 3½ p.c.	104—106	..	4 14 4
137,500	,,	Dec. 28	4	4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104—106	..	4 14 4
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands-worth and Clapham } A 5 p.c.	—	..	—
255,636	,,	,,	6⅔	B 3½ p.c.	140—145	..	4 9 8
75,000	,,	,,	5⅝	C 3½ p.c.	113—115	..	4 17 6
79,416	,,	Dec. 28	3	3 p.c. Deb. Stk.	79—82	+½	3 13 2
779,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	102—104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	101—104	..	3 16 11

Prices marked † are "Ex div."

Diaries and Calendars.

As usual at this season, we have received many diaries and calendars for the New Year, and now briefly acknowledge some. A useful blotting-pad, with an interleaved diary (a week on a page) attached, has been sent by the Parkinson branch of Parkinson and W. & B. Cowan, Limited, whose specialities are shown in the centre of each sheet of blotting-paper. From the Cowan branch of the same firm, we have received one of the neat pocket-books they send out annually, containing prices and particulars of their wet and dry gas-meters. Another blotting-pad, sent by Messrs. Gibbons Bros., Limited, of Dudley, will be found serviceable in a gas manager's office. From Messrs. Fletcher, Russell, and Co., Limited, we have received a block office calendar, showing on each day one of their stoves. A diary sent by Messrs. F. C. Sugden and Co. gives particulars of Hudson's patent producer, as applied to their regenerative and generator settings. Inserted in the diary is a £1000 railway accident insurance policy, which should ensure for the book a place in the recipient's pocket. The Simon-Carvès Company have sent us one of their tastefully got-up block calendars, with the usual excellent selection of quotations from celebrated authors. We have also to acknowledge, from Messrs. Hazell, Watson, and Viney, Limited, their well-known "Annual" for the present year, which contains several new and interesting features. In addition to recording the news of the world up to date, there are specially-written articles dealing with the principal events of the year 1906, which make the book of exceptional value. A glance through its 700 pages shows that the Editor, Mr. W. Palmer, B.A. (Lond.), has noticed every leading politician or public man who in any way came into prominence during the past year. The contents of the book, revised to the 1st ult., are arranged in alphabetical order, and there is a special index. The "Annual" is published by Messrs. Hodder and Stoughton, of Paternoster Row, E.C. The Winstanley Speciality Company, of Birmingham, have sent us a neat little pocket diary and engagement book (one of the Charterhouse series), containing an insurance coupon of the Ocean Accident and Guarantee Corporation.

The Snowstorm and the Devonport Water Supply.—One effect of the heavy snowfall on Dartmoor on Christmas Day was to block up the leat which supplies Devonport with water. The leat is an open channel for many miles, and the snow drifted into it at two points—one near Princetown and the other at Roborough. Mr. Lillicrap, the Borough Water Engineer, took immediate steps to have the channel cleared; and a large number of men were set to work to dig out the snow. Difficulties of this kind will be reduced when the works proposed to be executed under the Devonport Corporation's new Water Act are carried out, as the supply will be piped for part of the distance in which it now flows in the open leat. In consequence of a similar, but worse, experience in 1891, Plymouth decided to discontinue the use of the leat which had served the town since the days of Sir Francis Drake, and laid a main for the conveyance of the water to the town.

A Good Outlook at Tipton.—At last month's meeting of the Tipton Urban District Council, a letter was read from the District Auditor alluding to the overdraft on the accounts of the gas-works, amounting to £4000, which he stated it was absolutely necessary should be liquidated at the earliest possible moment. The Chairman (Mr. J. Powell) said that there was a prospect of securing such profit from the undertaking as would enable the Council not only to comply with the request of the Auditor, but reduce the price of gas in April.

The Uses and Bye-Products of Coal.—On Thursday, the 20th ult., a lecture on the above subject was delivered in the Friends' School-room, Stockton-on-Tees, under the auspices of the "Friend" Lodge of Good Templars, by Mr. Matt. Dunn, the Assistant-Engineer at the gas-works. In the course of his lecture, Mr. Dunn dealt with the comparative values of electricity and gas for lighting purposes, and illustrated his remarks by practical demonstrations. He was listened to by a large and appreciative audience, and everything passed off satisfactorily.

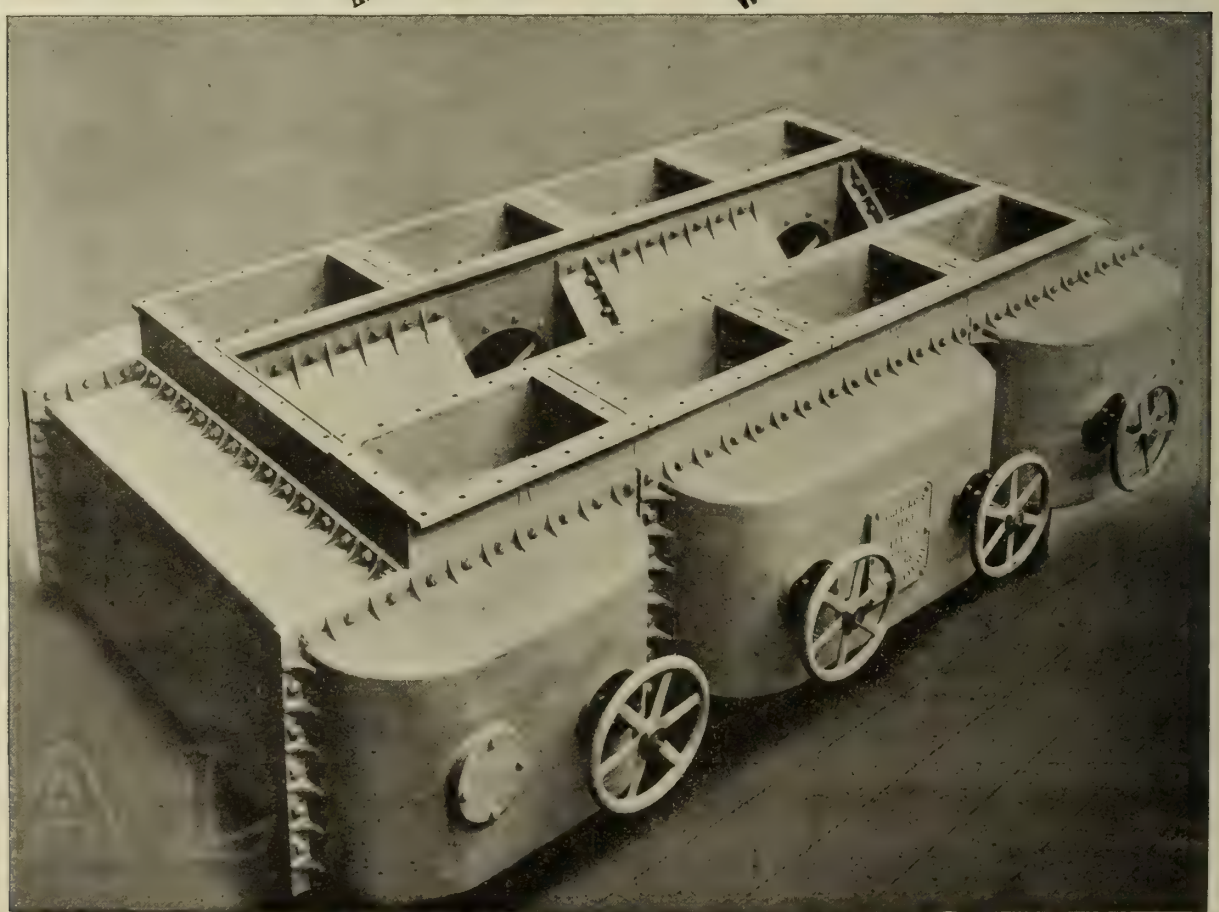
Cost of Gas and Electricity at Ipswich.—The Ipswich Town Council have renewed their contract with the Gas Company for lighting the street-lamps, upon the same terms as at present; but before the recommendation of the Lighting Committee to this effect was agreed to, one member asked if the question of lighting some of the thoroughfares with electricity had been considered. The reply of Mr. H. W. Raffe, on behalf of the Committee, was that the cost of gas was considerably less for an equal amount of light; but that if the Corporation were prepared to pay 25 or 30 per cent. more for lighting the town with electricity, the Committee would go into the subject. He always understood that Ipswich was one of the best lighted towns in the whole of England. Mr. Pretty said the Electric Light Committee offered to put a lamp up on trial; but they had had no reply. Mr. Raffe: We had the cost; and that is what we had to go by.

Municipal Electricity Supply at Woolwich.—Referring to the electricity supply undertaking of the Woolwich Borough Council, of which mention is made in the review of electric lighting in the past year which appears elsewhere, the "Pall Mall Gazette" a few days ago said: "The promoters of the County Council's electric trust cannot draw much encouragement from the experience of Woolwich under municipal management. Sir Alexander Kennedy, who has been called in as an expert to advise on the electrical undertaking, gives the Borough Council exceedingly cold comfort. The whole enterprise must be reorganized, he says, and even then it cannot show a profit for many years. There are two fully-equipped stations where there need only have been one, much machinery is idle, the staff is too large, and (naturally) nothing has been allowed for depreciation. The borough has spent a quarter-of-a-million already on the electric toy; and Sir Alexander Kennedy suggests that, instead of plunging to regain its losses, the Council should consider the advisability of taking a bulk supply from a private company. It will be no joke when the same sort of song has to be sung to the tune of many millions."

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Coventry Gas-Fitters and the Corporation.—The Gas Committee of the Coventry City Council have further considered the memorial from the Coventry Gas and Electrical Engineers' Association with respect to the supply of fittings, &c., by the Gas Department, which was discussed at the last meeting and adjourned. It was resolved that the Committee cannot see their way to make any alteration in the present practice.

Gas Explosion and Fire at Lancaster.—While a man named Thomas Rose was engaged in lighting a fire last Sunday morning in his cottage in Graham Street, Lancaster, a violent explosion occurred, which blew out the windows, set fire to the room, and severely burnt Rose. Two other cottages were also set on fire; and the brigade were several hours engaged in putting out the flames. It is said that an accident to the service-main caused the explosion.

Record Gas Consumption in Manchester.—The week ending Dec. 20 was a record one in Manchester, as regards the consumption of gas, which, owing to several days of very thick fog, amounted to 165,126,000 cubic feet. The previous record was 160,578,000 cubic feet, for the week ending Dec. 25, 1904, when there was an even thicker fog. The return for the nine months since April 1 last shows an increase of 6¼ per cent. as compared with the same period of the preceding year; while the day consumption increased 21 per cent.

Arc Electric Lighting at Croydon.—There was great discussion at Croydon not long since over the question of making certain extensions of the electric arc lamps in order to bring more grist to the Corporation electricity mill. But discontent with the arc lighting must be brewing when "Argus" writes thus in the "Croydon Advertiser:" "Some of your readers may not want too much illumination thrown on their doings just at this time; but certainly they have something to complain of in the electric lighting of Croydon. Something ought to be done to make the lights more brilliant, or else we ought not to have to pay for the present arc electric lamps, which are little better than a delusion and a snare. Why, the gas-lamps, with incandescent burners, are better by far. They do light the roads and the footpaths. What is the good of an arc electric lamp which only lights the firmament and gives the stars a chance?"

The New Gas-Works at Hathersage.—In a paragraph on this subject which appeared in the "JOURNAL" for the 18th ult., it was stated that, owing to some mistake with regard to the ironwork, the plant would not be completed by the expected time. We learn from Messrs. J. Firth Blakeley and Co., the sole Contractors for the works, that the mistake alluded to was of a very primitive nature, and that it has not been the means of delaying the completion of the work; such delay having arisen purely from alterations by the Engineer in connection with the buildings, and from the trouble experienced with water through the position of the site selected for the works. Moreover, the weather during the past six weeks has been to a large extent the means of retarding building operations. They add that the retorts and other plant, with the exception of one or two coupling-up pipes, are all ready for gas making; and they expect to finish within another fortnight.

The Award in the Hastings Tramways Arbitration.—In the last number of the "JOURNAL" we announced that the Arbitrator in the Hastings Tramways case (Mr. H. Graham Harris) had decided that it was not necessary to alter the position of the Gas Company's mains. We learn that, under the terms of the award, the parties are to bear in equal proportions the expense of excavating and making good the trial holes made for his inspection; and that they are also to pay their own costs of the reference.

Fatal Accident at the Bury Gas-Works.—A verdict of "Accidental death" was returned by the Jury who inquired into the death of John Taylor, an oiler and greaser at the Bury Corporation Gas-Works, who met with a fatal accident last Sunday week. He was examining a retort-discharger, when his head caught between a portion of the machine and an angle iron. The machine was moving at the time, and his head was fearfully crushed, causing fracture of the base of the skull. Deceased died soon after admission to the infirmary.

Gas-Meter Testing in Manchester.—In their annual report, the Manchester City Justices' Committee for the Gas-Meter Testing Department state that the index-test is applied to all gas-meters tested on behalf of the Corporation; and the result is that in the Manchester area only accurate meters are now supplied to consumers, who thus possess a privilege which the members of other municipalities will not enjoy until the present law has been amended and the "double test" made compulsory, or until arrangements have been effected similar to those in operation in Manchester.

The Financial Position of the Swadlincote Gas Undertaking.—In the "JOURNAL" last week, we gave some figures from the report of Mr. Alderman Hart, of Derby, who was called in to examine the accounts of the Swadlincote gas undertaking for the year ending the 31st of March last, which had been adversely criticized in the Urban District Council. It was then stated that a special meeting was to be held, to which Alderman Hart was to be invited to explain some of his figures. Meanwhile, the local papers seem to be quite satisfied with the result of the independent investigation, as will be gathered from the following comments in the "Burton Mail:" "It seems clear that the gas management have erred but slightly in assessing the profit for the year ended last March. The department, after paying off a very large charge for instalments of capital and interest, have made a profit of £934; whereas the Council's own officials assessed it at about £971—not a very material difference." Referring to the remarks of Mr. Howard as to the price of gas, the writer says: "What Mr. Howard and his like overlook is that the business of the Gas Department is gradually purchasing the works for the community. . . . If councillors' statements as to the figures of the report are authentic—and we judge they are, since they went unchallenged—the Committee's administration of the gas-works is abundantly vindicated. After paying off the excessive capital charges, they have produced a considerable profit, and deserve well of the Council and their constituents."

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PICTURES, No. 11.

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Sales of Shares.—At the White Lion Hotel, Hyde, a few days ago, Mr. C. H. Brogden offered for sale £1000 of 7 per cent. stock of the Hyde Gas Company, in lots of £100; and the prices realized ranged from £160 to £162 10s. per lot. On the same occasion, some original £10 shares (10 per cent.) in the Company fetched £26 10s. and £26 12s. each. At a recent auction sale, 35 £10 ordinary shares in the Wey Valley Water Company realized from £14 to £14 2s. 6d. each; and 100 £20 5 per cent. cumulative "B" preference shares in the Farnham Water Company, from £25 to £25 15s. each.

Fixing Gas Appliances.—In an article on this subject in the current number of the "Ironmonger," the writer emphasizes the point that it is never economical to starve the supply of gas. The service-pipe to the apparatus should be of the same size, at least, as the maker's fitting on it; and if the service is a long one, a size larger pipe should be used. If compo. pipe is employed, it should never be taken right np to the fitting. Burners, particularly atmospheric ones, should they light-back, are liable to become hot enough to melt a soldered joint; and consequently the pipe next the fitting should be copper or iron, with screwed joint, for about 3 feet from the connection on the stove. It is best to use wholly hard-metal pipe where possible.

An Unfortunate Result of the High Price of Copper.—The public lamps in quiet spots in the districts surrounding Cardiff have been raided recently, owing, as a local paper puts it, to the increase in the price of copper. The frames of the lamps are made of copper; and it is believed that the thief or thieves take out the glass and roll up the metal. Though the Cardiff Gas Company and the District Councils concerned have offered substantial rewards for the discovery of the depredators, up to the present only one arrest has been made; but while this man was in custody other lamps were stolen, which goes to prove that the thefts are the work of an organized gang. The value of each lamp is about 25s.; but the copper taken and sold as waste only realizes 2s. or 3s.

The Davis Gas-Stove Company, Limited, have just appointed Mr. W. S. Gilbert as their managing representative for London and district.

At the West London Police Court, a few days ago, Catherine Dean was sentenced to 21 days' hard labour for breaking open with a poker a prepayment meter, the property of the Gaslight and Coke Company, and stealing therefrom 16s. 6d. in coppers.

By an advertisement which appears elsewhere, our readers will see that the firm of Messrs. William Grice and Sons, Limited, of Birmingham, has been converted into Grices' Gas-Engine Company, Limited, with works at Carnoustie, as well as in Birmingham.

The Paddington Borough Council have instructed their representative on the Metropolitan Water Board (Mr. Karslake) to request the Board to discontinue cutting off the water supply from premises in respect of which the rate has not been paid, and to substitute legal proceedings where necessary for the recovery of amounts due.

The members of the Windsor and Eton Scientific and Archæological Society recently paid a visit to the works of the Windsor Royal Gaslight Company, on the invitation of the Engineer, Mr. H. Buckley, who, while showing the party round, fully explained the process of gas manufacture. At the conclusion of the inspection, a hearty vote of thanks was accorded to Mr. Buckley.

Messrs. Mather and Sons, of Wellingborough, have just supplied to the Coventry Water-Works pumping plant to lift an additional 300,000 gallons of water per day. The plant consists of a gas-engine of 15-H.P. and a set of three-throw pumps, 11 inches in diameter and 20-inch stroke, driven by intermediate gear at a speed of 21 to 22 strokes per minute. Mr. Charles Hawksley, the Corporation's Consulting Engineer, has superintended the erection of the machinery and the buildings necessary to accommodate it.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Oswestry Gaslight and Coke Company. Applications by Jan. 12.
ASSISTANT ENGINEER AND MANAGER. Preston Gas Company. Applications by Jan. 8.
OUTDOOR SUPERINTENDENT. Waterford Gas Company.

Situation Wanted.

BOOKKEEPER, SHORTHAND WRITER, AND TYPIST. No. 4686.

Stocks and Shares.

CAPE TOWN AND DISTRICT GAS COMPANY. Jan. 9.
CHIGWELL, LOUGHTON, &c., GAS COMPANY. Jan. 15.
TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY. Jan. 28.

TENDERS FOR

Coal and Cannel.

COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 3.

Fire-Clay Goods.

BOLLINGTON GAS DEPARTMENT. Tenders by Jan. 7.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 15.

Gasholder (Telescoping).

TEIGNMOUTH GAS DEPARTMENT. Tenders by Jan. 8.

Lead, Lead Pipe, &c.

PLYMOUTH WATER DEPARTMENT. Tenders by Jan. 15.

Mantles.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY. Tenders by Jan. 10.

Oxide (New and Spent).

ISLE OF THANET GAS COMPANY. Tenders by Jan. 10.

Tar and Liquor.

HARWICH GAS COMPANY. Tenders by Jan. 5.

Valves, Hydrants, Cocks, &c.

PLYMOUTH WATER DEPARTMENT. Tenders by Jan. 15.

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MILLOM GAS DEPARTMENT. Tenders by Jan. 29.

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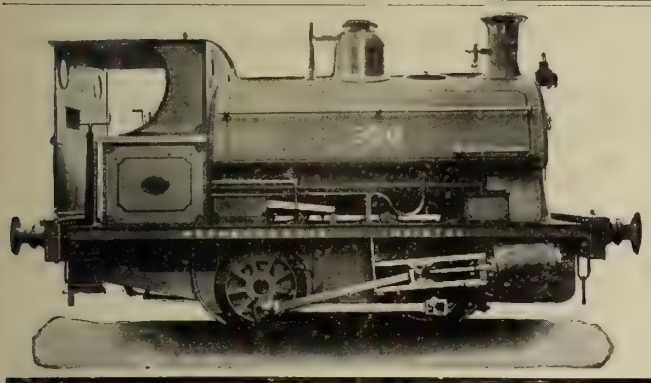
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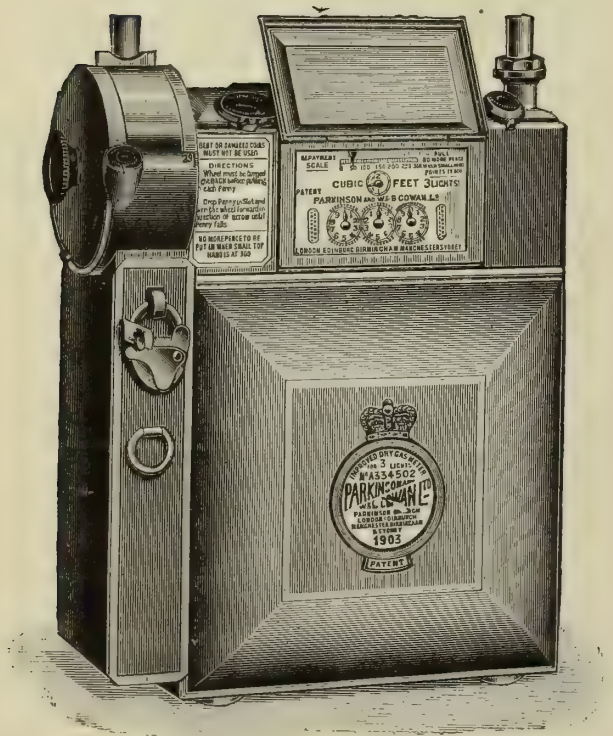
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Luminous Advances.

CONSIDERING the amount of matter with which readers are presented weekly in the "JOURNAL," it is quite pardonable for the most industrious among them to allow points of importance to escape their notice. Sometimes, too, it happens that what is really a point of value does not in an isolated existence strike one as being so; but when wedded to other points, the significance becomes more pronounced. So it follows, if one essential point be overlooked, the loss may for the time prevent full light being thrown upon others. Therefore, a reader of a technical paper requires to be not only industrious but most studious, to enable him to peer beneath the surface of things, to properly appreciate what is found there, and to make an orderly and valuable composition from the miscellaneous facts discovered. Consider, for example, the many contributions to the subject of incandescent gas lighting that have appeared in our columns from time to time during only the past few weeks. Individually, perhaps, those articles and papers have not taught us very much; but what do they do when taken collectively? They speak of advance, fortify hope, and shed brightness on the prospects of the gas industry in the sphere of lighting. Advance in incandescent gas lighting, in the efficiency and in the further cheapening of an already cheap light, can only be along three common tracks, represented by the burner, the mantle, and the gas supply. The question of the gas supply may, on this occasion, be left out of consideration, for as much as possible is now being done in the work of filing through the gyves forged in less competitive days, and in the pursuit by the gas engineer of further economies in production. This leaves only the mantle and the burner for consideration; and what has recent publication told us of them?

We will take the mantle first. Twenty-one years have now passed since the date of Welsbach's original patent; and the first magnificent advance after that was the same great inventor's success in discovering the proper impregnating fluid (which had presented a problem difficult of solution) that produced for the world in the opening year of the Nineties the practical mantle. It would have been nothing short of marvellous if, since then, no improvement had been effected. With a new invention, as a better understanding of requirements accrues and our experience accumulates, there must inevitably be a yield of improvement. So by, it is true, almost inappreciable steps we have got better mantles—mantles of greater refinement, greater durability, and with a higher and more constant light-yielding power. But improvement has not produced uniformity in the quality of the mantles; and the market is flooded, to the detriment of gas consumer and supplier and of the manufacturer of good class mantles, with indifferent makes. So much so, that in America, the advice has been seriously given that the American Gas Institute should take certain steps of an investigating and advisory character having for their ultimate end the protection of the users of mantles. Those who work in the shades of their own making in the mantle industry, and produce cheap and indifferent mantles, are obstructives to advance; and advance is our subject.

The work of those seriously striving after improvement has been of late directed to the one great object of attaining greater stability in the structure of the mantle. In mantles which have been described during the past year, inventors have claimed to have made long strides from the old fragility; and in the translation of Professor Drehschmidt's latest paper on incandescent gas lighting which we commenced to publish on Nov. 6 last, he bore high testimony to the work of Plaissetty in this particular direction. The approval of such an eminent and independent authority as Professor Drehschmidt must be very satisfactory to any investigator and inventor; but what Plaissetty gave, we are now assured, does not compass a further success that has passed the embryo stage to actuality. The first part of Professor Drehschmidt's paper should be read in conjunction with the contribution of Dr. Bohm to our columns on Dec. 25, on the new "Cerofirm" mantle, which, like that of Plaissetty, has for its base artificial silk. By artificial silk, the same quantity of the oxides of the rare earths is taken up as by three times its weight of ramie or cotton. Before incineration, Plaissetty treated his mantles with ammonia, whereby he converted the soluble salts of the earths into insoluble oxides. According to Dr. Bohm, Plaissetty was on the right road; but apparently he missed something of value that Bruno has found—that is to say, of value if prognostications are fulfilled when the "Cerofirm" mantle gets into the rough-and-tumble of every-day service. In the new mantle, the thorium salts of the impregnated unburnt-off article are treated with hydrogen peroxide; and by this treatment a thorium hydrate is obtained which does not expand but coheres. It is held to be due to this property that great stability is conferred on the mantle. Naturally, at this present stage, the subject is not one for statements too positively expressed. But here we have authoritative fingers pointing in at least one direction in which there is progress, and from which we may look for further advance, and the enhancement of the wonderful benefit already conferred upon the gas industry and its patrons by the little mantle that has immortalized the name of Welsbach.

The improvement in connection with vertical incandescent burners is not less satisfactory; but we are not sure that the best possible has yet been achieved in the ordinary types. There are those that give excellent results; but when we consider the candle power that is afforded per cubic foot of gas consumed with the stubby mantle of the inverted burner, there is reason for asking why, with a mantle of the much greater surface of the vertical burner, a still better result than that obtained at present should not be realized? However, there has been improvement, which has increased both efficiency and convenience. The same may be said of the high-power and high-pressure burners and lamps. Of this, *à propos*, there comes the confirmatory information that the Lighting Committee of Berlin have arranged a very comprehensive extension of street lighting on the high-pressure system. The length of streets and open spaces in Berlin lighted by this means up to recently has been about 6120 yards, served by 361 lamps; but the extension will comprise about 27,115 yards, with 1363 high-pressure lamps. It is, however, in the perfecting of the inverted system that the past two years or so have seen the greatest strides. As in mantles, so in inverted burners, there are the good and there are the indifferent. And we must emphasize Professor Drehschmidt's emphatic warning as to the necessity, if discontent and worry are to be averted, of making very careful selection. Above all things, it is desirable that such burners should have incorporated in them proper and easily manipulated provision for regulating the gas supply. Quite lately, in describing certain fittings, we have had something to say on this point; and there is further development close ahead. There is one thing where a little more ingenuity is required in connection with inverted burners; and that is in the devising of means whereby injury to the fittings can be avoided by hindering the transference of heat from the burner to the fitting. Professor Drehschmidt recommends the insertion of some sort of insulation.

Regarding the improvement that has been made in the duty rendered by inverted burners, the Professor, it may be remembered, read a paper before the German Association in 1905. Thereafter he continued his tests, and found makers advancing the merit in performance of their productions. The best result was with a burner that, when consuming 3·18 cubic feet of gas per hour, at 16-10ths pressure, gave 95 candles, or a duty when measured horizontally of about

30 candles per cubic foot, with a mean spherical illuminating power of 24·16 candles, and a mean lower hemispherical power of 31·94 candles. If the table and diagram published last week of tests made in Vienna of various lights—kindly forwarded by Mr. R. W. Wilson, the Secretary of the Imperial Continental Gas Association—is consulted, there is to be found remarkable similarity in connection with this efficiency of an inverted burner. It is a far cry from Vienna to Berlin; but there is the fact that in Vienna the "Graetzin" inverted burner (an unknown burner in this country, but some particulars of which are supplied elsewhere in this issue) gave a duty of 100 candles, with a consumption of 3·18 cubic feet per hour. It will also be observed that the best result, in respect of the light obtainable for a penny an hour, from all the types of lights mentioned, including the electric flame arc, was by this "Graetzin" light. Of course, the prices of both gas and electricity in Vienna are not those that obtain in this country; but their relation one to the other in Vienna has proportion with the ruling prices in the principal towns in this country. These tests from abroad corroborate the photometrical examinations that have been carefully made in this country—notably in Edinburgh—of other good types of inverted burners.

The inverted burner is without doubt going to exercise a vast influence in street lighting. Professor Drehschmidt confirms in his latest utterances all he has previously said about the excellence of the distribution of these burners. He throws out many useful hints about street illumination by the inverted burner, among them being the waste of light that occurs through the grouping of more than two burners in one lantern for street purposes, owing to the obstruction of radiation, unless the illumination is required for a purely local purpose—such as on a refuge at a crossing. What will be of interest now is to see the effect of the application of the high-pressure gas system to the inverted burner. In the few experiments that have been made in this direction, there have been difficulties; but we do not know that they are insuperable. In this connection, there is work awaiting the enthusiastic investigator.

From this review of the latest published information, it is seen that there are the best of reasons for gratification at the progress in improved result that incandescent gas lighting in all its branches is making. There has been no suspension of effort, but, on the contrary, much perseverance; and this, we feel confident, will not abate. Therefore we echo the words of Professor Drehschmidt that "the position "of incandescent gas lighting leaves no ground for fear that "it cannot compete successfully with other modes of light-"ing; and as further improvement may be expected as "much in gas as in electric lighting, the competition should "continue into the far future."

Statutory Gas Company and Local Authority Bills.

Important as are (to the promoters) the Bills introduced for the coming session by statutory gas companies and local authorities for additional powers, they are almost, as they stand in their original and unassailed form, innocent of any special features. In this remark, we, of course, except the Bill of the Kingston-upon-Hull Corporation asking for powers of purchase in relation to the East Hull Gas Company. The stream of events in connection with gas supply continues to flow towards the open. Whenever the illuminating power of gas is mentioned in the Bills under notice this week, it is 14 candles. In this matter of illuminating power, the gas industry is going by gentle steps; and, for the time, we are all well-satisfied with that power, accompanied by a rational system of testing it. In the cases of the Basingstoke, Maidstone, and Mitcham and Wimbledon Companies, and the Pontypridd District Council, the easy descent of 1 candle from 15 candles is proposed. And in the Penrith District Council's Bill, an illuminating power of 14 candles is mentioned, though that is the present statutory quality. Perhaps the District Council have been convinced of the folly of having 14 candles prescribed, and yet supplying 18 candles; and they want an excuse endorsed by Parliament for making a change from that wastefully rich gas, whose illuminating constituents are found to be no good in the incandescent burner, the gas-fire, and the cooker, or in the cylinder of a gas-engine. It is, however, of interest to observe that the local authorities are—when they do trouble themselves to ask new gas powers of Parliament—bringing themselves into line with the gas companies over this illuminating power question, and also in regard to its testing. All the companies and authorities named above (including the Falmouth Gas Company) are asking for the testing-burner last approved of by Parliament and the Board of Trade; and the standard of light is uniformly the Harcourt 10-candle pentane. But the Basingstoke and the Mitcham and Wimbledon Gas Companies and the Pontypridd District Council, want two strings to their bow in connection with the photometer—asking permission to use the bar or else the table form. The Penrith District Council are properly content with the bar photometer; but the Maidstone Company are showing preference for the table photometer. The Basingstoke Company are the only promoters in these groups with a discounts clause—10 per cent. for prompt payment and 15 per cent. for large consumption being named. The Company may like to have their tether shortened; most companies, with competition about them, prefer otherwise.

Among the Companies' Bills, is the measure jointly promoted by seven undertakings to provide for the repeal of the clauses compelling a strict limitation of sulphur compounds in the gas, other than sulphuretted hydrogen. Four of these Companies (Blyth, Eastbourne, Tynemonth, and Weymouth) are limited to the stringent, and formerly (in cases of any limitation at all) somewhat common, condition of 20 grains per 100 cubic feet, two (Scarborough and West Ham) to 25 grains, and one (Bath) to 30 grains. The Maidstone Company include a clause in their Special Bill providing for the repeal of the provision, imposed in 1880, limiting them to 20 grains. It is a little too early to speak of the likelihood of these measures going through without opposition; but we cannot entertain the belief that any of the eight authorities concerned will have the hardihood to enter upon an attempt to convict Parliament that their own work and that of the Departmental Committee of the Board of Trade, covering together the past three years, has been nothing but an egregious blunder. To do so will be but to court the defeat and the expense that the Newcastle-upon-Tyne Corporation sustained last year. The only other notable matter associated with the Statutory Gas Companies' Bills at the present stage, is that three out of the few Companies in Parliament this year are asking for power to convert and consolidate their capital. The convenience of this simplification of the capital account is so strongly marked by experience, that the surprising thing is that any old-established Gas Companies in Parliament in the present day neglect an opportunity of levelling down the differences in their capital accounts and in the dividend misrepresentations.

The Kingston-upon-Hull Corporation Bill, in which power is sought to compulsorily acquire the East Hull Gas Company's works, will, of course, be the main feature of the coming session—especially in view of the suspensory clause inserted in the Company's Act last session. In passing, it is interesting to note that, though the Merthyr Tydfil and the East Hull Acts of last session were, to the best of our recollection, the first gas measures in which suspensory clauses have been inserted, they are not the first instances connected with gas in which such a clause has been asked for. In 1898, the Stirling Corporation made application for a similar clause, but were refused. However, the Hull Corporation gained a point of advantage, at the opening of their aggressive action, in obtaining this suspensory clause; and in the Bill they are proposing to gain others. When the Corporation purchased the Kingston-upon-Hull Company's works, it was for an agreed price, which Mr. Thomas Newbigging said, at the time, was much below what he should have advised the Company to accept. Having got these works at a low price, the Corporation are—the the East Hull Company not apparently showing any amiable intention of complying with any stand-and-deliver suggestion—setting up, in the present Bill, little obstacles to (supposing Parliament passes the Bill) the Company realizing their full due, according to precedent, for their concern and compensation for the expense the Corporation are, uninvited, thrusting upon them. Naturally the Company will do their best to frustrate the passing of the Bill, and any way they will operate seriously against the obstacles named. This is a Statutory Company; and, if purchase goes to arbitration, the Corporation ask that "no allowance shall be made for "compulsory sale." Of course, they do not say why this should be; but they are graciously willing that the arbitrators should make such allowance as they think just for the recoupment of any loss of interest pending reinvestment, as well as for the cost of reinvestment, and for covering any expenses (other than the costs incurred in the arbitration)

which have been, or are likely to be, incurred by the Company or the stockholders, in consequence of the passing of the Act, and which ought, in the opinion of the arbitrators, to be borne by the Corporation. It is all very nice for the Corporation to try to force the sale of a concern in this way, and then expect to have preferential treatment, and make the Company suffer in respect of expense in which they are involved solely by the action of the Corporation. The Company are at the present time supplying their consumers at a cheaper rate than are the Corporation theirs; and however much the views of the present Parliament may incline to municipalization, they cannot avoid recognition of this, nor of the excellent status of the Company's present administration. We shall hear in due season why the Corporation expect preferential treatment at the hands of Parliament; but we are hoping the reply of Parliament will be, should they decide to pass the Bill (which we trust they will not), that this is a case for the greatest liberality within the limits of a just transaction.

"Slipshod" Photometry.

THERE will be general agreement with the expression of the view of Mr. Haydn Harrison, in his paper on the "Value of Photometry," read before the Leeds Section of the Institution of Electrical Engineers, that competition between gas and electric lighting has reached a stage when slipshod methods of gauging their respective efficiency and cost should be done away with. That is the very thing we have been trying to impress upon the electrical industry for a very long time, but with little success. Photometry, mainly through the work done in connection with the gas industry, has been of recent years brought to a level of scientific exactitude never before attained; and to a level that answers all purposes until something really superior is evolved. It is only comparatively lately that electricians have been interesting themselves in the matter; and they have been dabbling about on the borders of the well-beaten track ostensibly with the object of removing themselves as far as possible from the accomplished work of the gas industry. And the so-called success so far has been of an ill-cut character. We must decidedly demur to the photometrical methods of the gas industry being characterized as "slipshod," though, truly, it is an apt description of certain methods that have been devised in connection with the measurement of electric lights. If the respective efficiency of gas and electric lights is to be accurately ascertained, there must be, as near as the circumstances will allow, similarity in the methods of testing. The sooner this fundamental truth is recognized by electricians, and the sooner they submit to it, the sooner too will they reach the stage, so much desired by Mr. Haydn Harrison, when the proper gauging of the respective efficiency of gas and electric lights will be achieved.

But has Mr. Haydn Harrison contributed much towards the realization of what he so ardently desires? He has produced (we will not say invented), as will be seen by the abstract of his paper, a photometer, which appears likely to find its proper place as the "ugly duckling" of this photometer family; anyway, there is little doubt about it being an addition to the slipshod methods its author so deplores. In a published description of the instrument, it is stated that "the designer says the instrument is accurate to within 5 "per cent." This does not suggest to the practised photometrist any great refinement; and therefore we look to find where and how the inaccuracy arises. In the first place, there is the defective arrangement of the glow lamp, which, it is imagined, would be responsible for a very variable light. We do not see that there are any adequate arrangements for maintaining a uniform voltage, or for ascertaining what is the voltage. A much more elaborate rheostatic arrangement is necessary if testings are to be within any degree of the truth. A second inaccuracy in the photometer no doubt arises from the use of the spinning cardboard sector, known as the Whitman "Flicker" photometer, the claimed value of which was long since dismissed as fictitious by scientific investigators. With it, the lights are not received at the same angle; and though, of course, the flicker can be obtained sometimes, and at a certain point the flicker will disappear, yet, if it were possible to reverse the direction of the spinning disc, then the result obtained would be found to be vastly different. This is due to its whole principle being wrong. Its action is defective; and nobody who is adequately informed, and who wants an accurate instrument, would dream of using it. Apparently the reason it is used in the Harrison photometer is because, as is said in the paper, "the Whitman is not a patent." That is not a sufficient excuse for introducing inexactitude into photometry. Before Messrs. Simmance and Abady invented their ingenious "Flicker" photometer, we know that they made extended experiments with the Whitman disc, the Rood, and many other similar forms; and the inaccuracies found were carefully excluded from the rules then laid down, and have now embodiment, in their "Flicker" photometer, the patent for which embraces several forms. On the history of the subject, Mr. Simmance contributes an interesting letter to our "Correspondence" columns to-day. Universal accuracy in photometry and comparability of results will never be achieved while there are attempts to introduce apparatus constructed on inaccurate principles.

High-Power Lights and Shop Window Illumination.

Not too soon, the Court of Common Council of the City of London have made a little supplement to one of their rules regarding lamps for shop window lighting, which will have the effect of limiting the employment of high-power burners by City shopkeepers merely for advertising purposes, and not because they are otherwise useful. The rule that has been extended (by the italicized words) now reads: "The external dimensions of lamps shall not exceed 2 ft. 3 in. in any direction, and lamps shall not be fitted with high-power lights, *unless screened in such manner as to prevent the rays of light falling upon the public way.*" The dazzling and flickering lights of flame arc lamps suspended just above the heads of the users of streets are almost blinding; and, though the eyesight be strong, it is very irritating to pedestrians to pass along streets well and (for the eyes) comfortably illuminated, and then at intervals to have the glare of a selfish shopkeeper's lamps thrown into their eyes. There are some shops, too, where flame arc lamps cannot be used; and these shops have, unfairly, attention diverted from them by other more showily illuminated shops. The streets were not made for shopkeepers alone; and attraction to their premises ought to be made by other means than by a group of these excessively high-power lights. Goodness only knows what we shall come to if this illumination competition among tradesmen is allowed to be carried further. Certainly what is already being done produces most inharmonious effects in the illumination of streets. The Court of Common Council have made up their minds to put a spoke in this fast revolving wheel; and their direction to City shopkeepers is, if they want these lights, to keep them to themselves, by shielding them on the "off" side, so that the proper function of a tradesman's window lights may be adhered to without inconveniencing other people.

The Distribution Department.

The distribution department of gas undertakings has recently been receiving attention at the hands of two of the Junior Associations. In the "JOURNAL" for the 25th ult., we gave extracts from a lengthy paper, on "Lighting and Maintenance," read by Mr. L. F. Tooth before the London and Southern Junior Gas Association; and in to-day's issue there will be found the principal portions of a comprehensive contribution on "Distribution and Gas Supply" presented by Mr. R. J. Rogers at a meeting of the Midland Junior Gas Engineering Association on Saturday. Both papers were followed by very full discussions, which fact goes to show the great amount of interest that is taken nowadays—and quite rightly so—in the large, and ever increasing, number of subjects that are fairly covered by the titles chosen by the two authors. Perhaps the section of Mr. Rogers's paper that received most attention was the one in which he referred to high-pressure gas transmission. His opinion is that this is a question with which distributing engineers will be brought more closely in contact in the near future; and with reference to this the members generally were in agreement with him—the point of difference being in regard to the most advantageous methods of working. On the subject of high-pressure gas-lighting systems, the author gave expression to a view which did not by any means find general acceptance, when he said he failed to see any gain in using a higher pressure for the gas than 20 inches. The particulars given with reference to the saving secured in certain

business premises in Birmingham by the substitution of inverted gas-burners for incandescent electric lamps, are worth noting, as showing what can be accomplished under ordinary working conditions; while the general adoption of inverted burners (placed in ordinary lanterns) for the street lighting of Solihull—which has previously been referred to in the "JOURNAL"—is another "sign of the times." The rapid growth in popularity in all directions of the inverted burner is, in fact, a matter of the very first importance for all those who are in any way connected with gas undertakings. Several other topics were touched upon by Mr. Rogers; one being suction producer plants, figures regarding which were given to show that the position of town gas for engines up to 50 B.H.P. is assured when sold at the rate of 1s. 6d. per 1000 cubic feet. The reference to these plants naturally introduced the subject of stand-by charges for meters fixed on premises where producer gas is used; and, from this, the author went on to describe a method of preventing any intermixture of town gas and producer gas, where the former is used for starting an engine, and the latter for running it subsequently. Some remarks on the training of gas-fitters, and the advisability of instituting an examination in "Gas Distribution" somewhat on the same lines as the existing ones relating to "Gas Manufacture," brought to a close a paper which had provided a very full afternoon's business for the Association.

Mr. Norton H. Humphrys Ill.—Among the earliest letters received on New Year's Day was one which brought the news that Mr. Norton H. Humphrys, the Engineer and Manager of the Salisbury Gas Company, and the Vice-President of the Southern District Association, was suffering from serious illness, which had confined him to his bed for the previous ten days. An attack of influenza was followed by pneumonia, with the result that Mr. Humphrys was in a very critical state. He had been visited by Mr. Sainsbury, of Trowbridge, from whom the information reached us. At the time of writing, the fever had passed away; but it had necessarily left the patient in a very weak condition. The medical man in attendance, however, was satisfied with the progress made. Those of our readers who have had professional or personal relations with Mr. Humphrys—and they are by no means a few—will, we are sure, regret that he is prevented by illness from attending to his professional duties, but will be glad to learn that the latest reports as to his progress towards recovery are of a favourable character.

Porosity of Rocks and the Flow of Water.—In the last volume of the "Proceedings" of the Institution of Civil Engineers, an account is given by Mr. Baldwin-Wiseman of a series of investigations made by him during past years as to the relationship between the porosity of rocks and the flow of water through the interstices under varying pressures. The stones selected for experiment range from the carboniferous to the cretaceous rocks. They were carefully chosen and dressed into the form of cylinders 13 inches long and 6 inches in diameter. These blocks were placed in a steel case, and precautions were taken to prevent leakage. The water was supplied from a hydraulic accumulator at varying pressures up to 75 lbs. on the square inch. A drop of the piston (which acted in the steel case) of 1 centimetre was equivalent to a discharge of 62·06 c.c., and the area exposed was such that a discharge of 1 c.c. per second was equivalent to one gallon per hour per square foot of surface. Special attention was given to the question of re-soakage as bearing on the rate and amount of re-charging depleted strata after a long-continued drought. The results of the investigations are given in thirteen tables in the appendix to the paper; where also there are two tables showing the geological formation, depth of wells, quantity of water pumped, and other particulars of a large number of water-works, with details of the filter-beds.

Evaporation of Ground Water.—Experiments by Professor Charles S. Slichter in Western Kansas show that a considerable amount of stored ground water is lost in the first bottoms of the Arkansas River by evaporation. Although the measurements extended over only a very brief period, he considers them sufficient to establish the fact that the loss of ground water by evaporation is about ten times as great where the water is within 1 foot of the surface of the ground as it is where the water-table lies at a depth of 3 feet. The pumping plants that materially lower the ground water in the bottom lands will thus save a considerable amount of water that now goes to waste in evaporation and in supplying the rank growth of wild grasses that flourish in the first bottom lands. The Professor estimates that the savable loss amounts on the average to 1 foot of water for each acre of first bottoms during the months of July and August alone. Observations of evaporation were made by means of three tanks filled with natural soil in which the water plane was kept at a constant elevation, and the evaporation from an open tank was also determined. The rainfall, vapour pressure, percentage of relative humidity, and velocity of the wind were also observed; but they do not affect the main purpose of the experiments. At a depth of 3 feet below the surface, the ground water evaporation was from 0·4 to 0·17 inch; and at 1 foot, it was from 0·7 inch to 1·73 inches.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 106.)

LAST week witnessed the close of one year and the opening of another on the Stock Exchange, as elsewhere. The close was calm and cheerful—a presage of what was to come. Tuesday, being New Year's Day, was a holiday; and on Wednesday the Exchange reopened for business, which was not dissociated from pleasure. For, although business was quiet at first, there was a cheery tone all round; and it looked as if the whole House was determined to banish melancholy, and insist on making markets good and strong. Before Thursday closed, there were signs of reaction, as if the buoyancy had been a little overdone, beyond what the actual buying justified; and in most lines there was a set-back, though Consols did not suffer. On Friday, there was a recovery to some extent; and on Saturday the tone was as good as at any time. Consols were done at 87$\frac{1}{32}$ for the account; and home rails were in good odour along with other investments of that class. Of course, the mainspring of all this was in the Money Market. After the turn of the year, rates grew steadily easier; and now, in the steadfast hope of an enduring relaxation of the gold squeeze, people are looking forward to the close advent of a lighter official rate. Business in the Gas Market was quiet enough on Monday; but after the re-opening it started off at a lively rate—fully sharing in the general cheerfulness. There were not many changes in quotations, however, and those which were made were not large. In Gaslight and Coke issues, the ordinary was quite active and buoyant. The lowest price marked was 99 on Monday, after which 99$\frac{7}{8}$ was recorded several times—a rise of $\frac{1}{2}$ in quotation. The secured issues were little noticed. The maximum changed hands at from 89$\frac{1}{8}$ to 90; the preference was done once at 108; the debenture was not dealt in. South Metropolitan was quiet and firm. A small parcel was done free at 128; but ordinary transactions were between 128$\frac{3}{4}$ and 129$\frac{1}{2}$. The debenture was done at 86 special, and 86$\frac{1}{2}$. In Commercials, the 4 per cent. was marked at 110$\frac{1}{8}$ and 111$\frac{1}{2}$, the 3$\frac{1}{2}$ per cent. at 107, and the debenture at 83$\frac{1}{2}$. The Suburban and Provincial group was very quiet. Alliance old advanced $\frac{1}{2}$, Bournemouth "B" was done at 17$\frac{1}{4}$ and 17$\frac{5}{16}$, British at 43, North Middlesex 7 per cent. at 14 and 14$\frac{1}{8}$, South Suburban preference at 125, and West Ham ordinary at 105 (a rise of 1 in the quotation). On their local Exchanges, Newcastle was easier; but Sheffields had a further advance, and are now in the proud position of figuring at a level 4 per cent. price for money. The Continental Companies were fairly busy. Imperial was quoted half-a-point easier, with transactions ranging from 177 to 178$\frac{1}{2}$, Union preference was done at 139$\frac{1}{2}$ free, and European part-paid realized 18$\frac{7}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at 11$\frac{1}{2}$, River Plate at 12$\frac{3}{4}$ and 12$\frac{9}{16}$, Primitiva debenture at 95$\frac{1}{2}$, and Melbourne 5 per cent. at 102.

The closing prices are shown in our Stock and Share List on page 106.

ELECTRIC LIGHTING MEMORANDA.

On Charging for Electricity—A Novel Scheme from Norwich—Trying to Beat up Business at Bradford—Herr Schaefer's Paper on the Relative Dangers of Gas and Electricity.

INGENUITY appears inexhaustible in devising fresh systems of charging for electricity. But there would not be so much time spent in this way, if there was not very real necessity for it. Every new system that sees the light of day supplies additional testimony to the difficulty of encouraging new business and of maintaining the old. Norwich has produced an alternative scheme of charging, which certainly has the merit of novelty; but scant consideration will allow anyone of average intelligence to agree with the "Electrician," that the proposal is "particularly unscientific," and with us that, in its conception and foundation, there is a very fair proportion of "simplicity." It is one of those systems against which it is desirable to warn consumers; for to get any substantial advantage from it, it is necessary for a consumer to be very extravagant—in other words, the more extravagant the consumer is, the cheaper he gets his electricity. The proposal, in short, is a delusion and a snare. Those who adopt it will be compelled, whether or not they like it, to use electricity to a minimum amount equal to 12 per cent. upon the assessment of their houses or premises; and to gain whatever satisfaction is to be obtained from using slightly cheaper electricity, the system will impel to larger consumptions than at present. If, however, the consumer desires to keep in his pocket the saving to be effected by the alternative scheme on present consumption, he will not exceed the consumption by a single unit. But that is not the object of the new proposal. The scheme contemplates a fixed charge per annum of 12 per cent. on the net assessment of the premises supplied (which will include the meter-rent), and 1d. per unit for all current used. The circular issued to the consumers speaks of using current at 1d. per unit. A consumer will be foolish who thinks he is using electricity at any such cheap rate. He has to divide his total cost (including the 12 per cent. on the assessment) to find out what he is really paying per unit.

Take from the circular, as an illustration, a consumer living in a house whose net assessment is (say) £56, and who finds 530 units of electricity at 4½d. quite sufficient for all his needs. He pays for this (including 10s. for meter-rent) £10 8s. 9d. The new tariff will claim from him 12 per cent. on £56, which is equal to £6 14s. 5d. That is a definitely fixed charge; and 530 units at 1d. would cost £2 4s. 2d.—or a total of £8 18s. 7d. He therefore "saves" £1 10s. 2d., but is still paying a full 4d. per unit for his electricity, which is dear for lighting compared with the incandescent gas system of illumination, and absolutely extravagant for any other purpose. The consumer so far saves ½d. per unit; and after expending £8 18s. 7d. he has to go on using electricity, and spending his saving, in order to obtain the satisfaction of using electricity at, as is suggested, 1d. per unit. But even if he spends all the £10 8s. 9d. that was the sum of his account before, he still pays an average of 3d. per unit. There are, however, few consumers living in a house whose net assessment is £56 a year, who will be wanting to use 892 units a year, in order to get down to an average charge of 3d. per unit. Fancy a consumer employing a radiator, containing four 220-volt lamps, each lamp in parallel using 250 watts, or the four threepennyworth of electricity per hour! Consumers will show their wisdom by not being induced to put in wasteful radiators under the pretence that they will be using electricity at 1d. per unit; for the above calculations show that they will be doing nothing of the kind. They should also consider the matter well, before being tempted to discard their part lighting by gas in order to gain under this illusory scheme any advantage in the price of electricity compared with the present. Unless rooms are fitted up in a costly way—and every new point of incandescent electric lighting, be it remembered, requires 2s. to 3s. per annum spent on it for renewals—gas, oil-lamps, or candles will still be required, judging from a complaint in an editorial note in the breezy local paper "Daylight." The writer remarks:

> Every day one comes across someone who has determined to revert to gas, with the result that, ere long, the revenue of the electricity works must cease to expand, even if it does not almost immediately show a distinct falling off. It is all very well to invite consumers to adopt a new basis of charging. But what the public want is a better light; and, if they don't get it, the progress of the Gas Company must continue with uninterrupted triumph. I am writing this paragraph directly under three "16-candle" power incandescent electric lamps; and I have had to requisition an incandescent mantle gas-light before I can properly finish my work. Now that I have done so, I can well spare the three 16-candle power electric lights, for the brilliancy of the one incandescent gas-burner is more than sufficient.

The idea of the scheme being to tempt consumers, why not make an all-round reduction of ½d., and not (as the present scheme does) ask the consumers to forego, for the sake of this remarkable charging project, the power that they possess under the present system of regulating their own consumption? The department are no doubt anxious to book a definite income. One safeguard, however, consumers who look favourably upon the scheme should insist upon is that no one shall serve on the Corporation Electricity Committee who has any connection whatsoever with the rating authority of the city. Who knows what dreadful thing might happen if, as a result of this scheme, the revenue of the department fell off! Certain it is that there will have to be a big revision of the scheme, should the consumers on the flat-rate of 4½d. hereafter receive a reduction. If they get a reduction of ½d. at any time, then to make the new alternative system attractive, retaining the lump sum yielded by the 12 per cent. on the net assessment, electricity will have to be supplied at ½d. per unit to those under the new system, to maintain, in the case of the £56 house, the saving of £1 10s. 2d. a year on present consumption. Looked at all round the attraction is not sufficient, and the withdrawal of freedom from the consumer is really asking too much.

In the struggle to improve the financial condition of his department, the City Electrical Engineer of Bradford has also been making recommendations with the view of drawing new business, and incidentally of complicating things. He recommends that a restricted hours' supply of power and heating should be offered to consumers at a flat-rate of ¾d. per unit, provided that no current is taken from the mains between half an hour before sunset and 7.30 p.m. The bicyclist's lighting-up table should come in handy here, as an indication of when to discontinue the use of the ¾d. energy. But we can picture the consumer for heating getting colder than usual after half an hour before sunset and up to 7.30 p.m., and the power user who is pressed with work using bad language during the same period. Then where there are private electrical plants, it is proposed that facilities be offered for taking a supply for stand-by purposes from about noon on Saturday until 9 a.m. on the following Monday—for lighting, heating, or power—at ordinary rate. This will involve the establishing and disconnecting of the supply at the week-end, at the written request of the consumer. The minimum charge is to be £6 per annum, which would cover all current to that value consumed during the year. Under both schemes, the consumer will have to bear the whole cost of the service lines between the mains and his premises, and pay rental for the special timing and measuring instruments installed. Then, with regard to ordinary lighting consumers, while other places are abandoning the maximum demand system, Bradford is now proposing to apply it. This is another wasteful system from the consumer's point of view, unless he be a shopkeeper, an exceptionally long-hour user, and runs fairly uniformly the whole of his lights. The prices to be charged are 7d. and 1d. In other words, during each half year, consumers will have to pay 7d. per unit for so much electricity as is required to *keep the total number of lamps registered* alight for one hour a day, or 182½ hours in the half year—the balance of electricity being supplied at 1d. per unit. Supposing a householder has fifty lamps installed, but never, excepting when entertaining friends, requires more than a dozen or fifteen lamps going at any one time, and has short-hour lighting in the summer, it will be better for that householder to stick to his present flat-rate of 4d. per unit. The Engineer also suggests that rental for fuse-boxes should now be abolished; and that the free supply of lamps should be extended by giving sufficient lamps to enable replacements to be made after 500 hours' use instead of 1000 hours. This will cost more; but it is by losing money that the Department hopes to gain more. And so these wonderful devices for getting new custom for electricity and conciliating present consumers continue to be evolved.

We are still in the season of the year when, above all other seasons, the spirit of magnanimity should animate us; and therefore the compliment paid us by "Meteor" of the "Electrical Times," by referring to the "JOURNAL" as "our good friend," is fully reciprocated. "Our good friend" "Meteor" accuses us, in his notes published on Dec. 27, of rejoicing with exceeding great joy in our "current issue." Christmas festivities had evidently caused "Meteor" to lose count of time. Our then current issue was dated—perhaps it ought not to have been—Dec. 25; the issue in which "Meteor," in his convivial mood, detected our exceeding great joy was Dec. 18. Therefore the description of "current issue" was not quite in accordance with the fact; and that is not the only point in the notes that has gone astray. The cause of our exceeding great joy, it appears, was Herr Schäfer's useful paper on the "Alleged Dangers of Coal Gas." Our good friend "Meteor" is a man of meteoric moods. From jocularity, he travels with most amazing rapidity into indignation and abuse. Herr Schäfer's paper is characterized by him as a "dreadful hotch-potch of statistics, largely guesswork." This is extremely rude and uncharitable after Herr Schäfer's pains to state in his paper the official sources of his information. If "Meteor" can say where more reliable statistics can be obtained than from the returns of the Magistracy of Berlin, the "Berliner Elektrizitätswerke," the "Electro-Technische Zeitschrift," the Royal Statistical Office of Prussia, the Association of Private Fire Insurance Companies, the Public Insurance Societies, and the Berlin Fire Brigade, we have no doubt Herr Schäfer will be much obliged to him for allowing him to participate in his superior knowledge. There is also a poor attempt to throw ridicule upon Herr Schäfer's application of the law of averages in ascertaining the relative dangers of gas and electricity. Where Herr Schäfer is, in "Meteor's" judgment, wrong in his methods, that gentleman does not attempt to explain. We cannot see anything to complain about in drawing the conclusion that, assuming in a town there are 5000 horse-drawn vehicles and 1000 motor cars, and assuming the former in one year cause 103 deaths and the latter 93, the horse-drawn vehicles are, from the public point of view, the less dangerous form of traction. Similarly with gas and electricity. The statistics in the early part of Herr Schäfer's paper prove conclusively, from official returns relating to Berlin and thirty other important towns taken at random, the superior use of gas in Germany; and it is quite a legitimate use that he makes of the information so obtained. If "Meteor" is not satisfied with Herr Schäfer's figures because "the notoriously shoddy and haphazard wiring methods in Germany show electricity at its worst," perhaps he will take the report issued last year by the Fire Brigade Department of the London County Council, collect the figures as to the number of electricity users and gas consumers in London, and see what he will learn from the published figures as to gas and electrical fires in relation to the extent of use of the two commodities.

"Meteor" writes to please his readers; but we are somewhat surprised that he endeavours to make capital out of a single sentence without giving consideration to the circumstances under which it was written or to the point of view of the author. "In the most artless manner," our electrical friend writes, "the compiler admits that, 'the utmost care has been taken to exclude cases of suffocation or poisoning due to the escape of carbon monoxide from domestic and similar heating apparatus.'" Now we should like the words preceding this sentence to be read in conjunction with them; but "Meteor" omits them. The words were: "All cases known to be deliberate murders or suicides with gas have been omitted, and deaths caused by gases *other than coal gas or illuminating gas* have also been omitted." Then consider what Herr Schäfer meant by his reference to "domestic and similar heating apparatus." Gas-fires have not obtained such extensive use in Germany as in this country; and when a writer in Germany speaks of "domestic and similar heating apparatus," he is referring to the closed stoves that are there commonly employed for heating. "Meteor" appears to have rigidly associated in his mind carbon monoxide and gas-fires to the exclusion of all other means of heating. Has he already forgotten Zola? As we understand Herr Schäfer, he did not exclude deaths directly traceable to coal-gas poisoning or suffocation; but he exercised the utmost care to exclude cases due to the escape of carbon monoxide from domestic and similar heating appliances, which,

as we have intimated, are not, in Germany, commonly gas-fires. Again it is stated by the critic that in 1901 there were "more than" (as there were 19,941 he should have said "less than") 20,000 fires from all causes; and he wonders "how many hundred of these were started quietly by gas-jets and gas-stoves and little spouts of flame from leaky pipes." Incandescent gas-burners covered by glasses or globes have almost universally taken the place of the gas-jet in Germany; gas-stoves being iron-cased have a happy way of performing their duty without creating fires and there cannot be "little spouts of flames from leaky pipes" without a light is applied to the leaks. "Meteor" seems to be labouring under the impression that little spouts of flame from gas-pipes are as plentiful as blackberries in the season. Should there be an escape, the householder is soon made aware of it; if he is prudent, he has the leak promptly and properly corrected. We, in turn, wonder how many of the 19,941 fires were caused by defective electrical fittings, the fusing of electric wires, and inflammable material coming in contact with electric lamps. There is no warning leak in these cases. Such meteoric flights of the kind to which we have been treated by "our good friend" on this occasion will not destroy facts such as those collected by Herr Schäfer from official returns.

OBITUARY.

EDWARD ARMITAGE.

It is with much regret that we record the death last Thursday morning, at the advanced age of 87, of Mr. Edward Armitage, the Chairman of the Longwood Gas Company. Those of our readers who accompanied the Manchester District Institution to Huddersfield and Longwood towards the end of May will doubtless recollect that at the luncheon at the Huddersfield Gas-Works Mr. Armitage was present, and offered a few words of kindly welcome to the members before they drove over to Longwood to inspect the works there, which are under the supervision of Mr. J. H. Brearley, the then President of the Institution. A few months later Mr. Armitage began to show signs of ill-health, and was confined to his house; but it was not until the early part of last week that his condition became serious. Bronchitis then set in, and he gradually succumbed.

Mr. Armitage was the fifth and only surviving son of Mr. Joseph Armitage, J.P., D.L., and was born at High Royd, Honley, on Aug. 27, 1819. He received his early education at Ormskirk, and subsequently proceeded to Brunswick to complete his studies. He entered his father's firm at the age of 16, and retired as senior partner in 1890. An interesting coincidence is that the foundation stone of Burdett Mill, Milnsbridge, which is one of those belonging to the firm, was laid by Sir Francis Burdett, the father of Baroness Burdett-Coutts, whose death occurred only a few days before that of Mr. Armitage. The deceased gentleman and his predecessors were among those who might be described as the pioneers of Huddersfield, for they were associated with the public life of the town long before it reached its present position of importance. He was one of the Improvement Commissioners; in 1876 he was placed on the Commission of Peace for the borough; and in 1882 he was appointed a Magistrate for the county. His death removes from local, or rather national, Freemasonry a distinguished figure, for he was believed to have been the oldest Freemason.

The late Mr. Armitage's business acumen was recognized by his appointment as a Director of the Huddersfield Banking Company, now the London City and Midland Bank, and also as a Director of the Palatine Insurance Company, which is now merged into the Commercial Union Assurance Company. He was also an Income Tax Commissioner, and was formerly a member of the Council of the Chamber of Commerce. In local business life he was ever to the front as Chairman of the Longwood Gas Company, having been in touch with the gas industry during the whole of his lifetime. It was as a member of the firm of Armitage Bros., that he obtained his first insight into the production and distribution of coal gas. In 1836, the firm put down gas-making plant for the lighting of the premises, and from time to time laid mains and services to other works and residences in the vicinity. The price first charged for gas was 10s. per 1000 cubic feet; and Mr. Armitage was able to recall the fact that when a contract was made for a supply to the London and North-Western Railway Station at Longwood at 7s. 6d. per 1000 cubic feet, the firm considered they were supplying gas at an exceedingly cheap rate. On the occasion of the visit of the Manchester Institution, already referred to, some interesting particulars were given of the history of the Company. It was formed in 1859; but it was not until 1874 that they acquired the works and mains from Messrs. Armitage, and then Mr. Armitage joined the Board. In February, 1876, he was appointed Chairman; and the growth and prosperity of the Company have been to a great degree due to his business ability. As long as he was able, he was a most regular attendant at the meetings of the Board. On Feb. 22, 1905, he was presented with his portrait in oils by the shareholders as a mark of their esteem.

Mr. Armitage was a widower; Mrs. Armitage having died on Sept. 11, 1901, three years after the celebration by her and her husband of their golden wedding. He leaves three sons and a like number of daughters. The interment was fixed to take place yesterday morning in Almondbury Cemetery, after a service in the Huddersfield Parish Church.

Mr. Thomas Dunnachie, the Manager of the works of the Glenboig Union Fire-Clay Company, Limited, died at Glenboig on the 1st inst., at the age of 86. Mr. Dunnachie began life as a teacher, and was afterwards a temperance lecturer for seventeen years. In 1874 he was appointed Manager at Glenboig, and held this position until quite recently. His favourite studies were chemistry and physiology, in both of which he attained a high degree of efficiency.

The death occurred early last Wednesday morning, at the advanced age of 93, of Alderman John Barber, J.P., of Nottingham. The deceased gentleman had for many years taken an active part in municipal affairs. As the result, to a large extent, of his exertions, the Corporation acquired the gas undertaking in 1874; and in 1882 he became Chairman of the Gas Committee. This position he held till he retired from the Council, when he was succeeded by Alderman Ford, the Vice-Chairman. Throughout the whole of his public life Alderman Barber never forfeited the character he earned among his colleagues for devotion to his duties, stainless integrity, and transparency of purpose; and when, on Dec. 14, 1896, he completed fifty years' public service, the event was signalized by the presentation to him of a massive Monteith bowl, a pair of five-light candelabra, and a tray, all of solid silver, by Magistrates, past and present members of the Town Council, and officers.

We regret to record the death on Christmas Day, from phthisis, of Mr. Charles B. West, the Chief Assistant to Mr. A. F. Browne, at the Vauxhall station of the South Metropolitan Gas Company. Mr. West, who was only 35 years of age, entered the Company's service in 1891, on the practical side, at the Vauxhall works, under Mr. Charles Carpenter. After going through the shops and other departments of the works, he became Chief Assistant upon Mr. Brown taking charge in 1899. He was highly esteemed and respected by his brother officers and the foremen and workmen; and he proved himself to be always an efficient, energetic, and loyal colleague and friend. The funeral took place last Thursday, at Teddington Cemetery, and was attended by Mr. Carpenter and representatives and personal friends of the deceased from the various departments of the Company's service at Vauxhall and other stations—Mr. Browne being among the number.

It is with much regret that we learn of the death of M. Paul Eugène Gigot, which took place at his residence in Paris on the 20th ult. M. Gigot was in his 71st year, and had quite recently retired from the important position he had filled with the Paris Cas Company as the Chief Engineer of their works. He was trained as an Ingénieur Civil des Mines, and had been a member of the Société des Ingénieurs Civils de France since 1868. We believe he never attached himself as a member to the French Société Technique du Gaz; but he was present at many of their meetings, and took an interest in their work. On the occasion of the International Gas Congress of 1900, when the Clichy Gas-Works were visited, M. Gigot most courteously and efficiently represented the Paris Gas Company, and graciously welcomed the International visitors. English and other engineers who visited the works at La Villette about three years ago to see the Paris charging and discharging machines will also remember the kindliness of their greeting by M. Gigot. Those who saw him more frequently and who knew him more thoroughly (and he had many friends in England, of which country he was very fond) invariably found him courteous, kind, and considerate, and always ready to give any information or assistance in his power. His quiet manner and friendly gentleness will be much missed by his professional colleagues.

"Thorianite."—In opening the Legislative Council of Ceylon on Nov. 22, Sir Henry Blake remarked that good progress had been made by the Mineralogical Survey Department. During the year, interest in thorianite had been maintained; but no further large deposits had been found.

A "Handbook on Petroleum."—We have received from Messrs. Charles Griffin and Co., Limited, a book bearing the above title by Captain J. H. Thomson, the Chief Inspector of Explosives, and Sir Boverton Redwood, Adviser on Petroleum to the Admiralty and the Home Office. It is the second edition of a work prepared for the use of Inspectors under the Petroleum Acts, and for those engaged in the storage, transport, distribution, and industrial use of petroleum and its products, and also of calcium carbide; and it contains suggestions on the construction and use of mineral oil lamps. The text has been brought up to date by the substitution of more recent orders in regard to petroleum for those previously given; and those dealing with the keeping of carbide of calcium and the compression of acetylene in admixture with oil gas have been added. In an appendix, the authors have included certain addenda and notes on the Petroleum Acts. The volume contains a mass of valuable information, which is rendered easily accessible to the reader by a full index. The price of the book is 8s. 6d. net.

GAS BILLS FOR 1907.

SECOND ARTICLE.

STATUTORY companies applying for further powers have to be first noticed this week.

After an absence of a score years, the Basingstoke Company are again in Parliament asking for capital consolidation powers, further capital, and authorization to additional land purchase. By the Act of 1887, the capital of the Company was fixed at £31,650, whereof £11,100 was 10 per cent. original stock, £5550 5 per cent. original stock, and £15,000 new 7 per cent. stock. Of the latter, the sum of £9500 has been issued, realizing premiums amounting to 5500—thus making the £15,000. In respect of the original stock, the Company were authorized to borrow £4000; and in respect of the new 1887 stock, £3750. The Company have borrowed altogether on mortgage of the undertaking £6000. The additional land the Company desire to purchase by agreement for gas-works purposes and storage is described in the schedule, and beyond they require power to purchase, also by agreement, land to the extent of 3 acres for the general purposes of the concern. The clauses bearing upon consolidation show that the stock is intended to bear a uniform standard dividend of 5 per cent.; the holders of original 10 per cent. stock to have allocated to them £200 of the consolidated stock for every £100 now held, £140 for every £100 of 7 per cent. original stock, and £100 for every £100 of 5 per cent. original stock. Sufficient stock is to be created for this purpose; and the Company also ask to be allowed to raise additional capital to the amount of £30,000, with one-third borrowng powers. A renewals fund is provided for. The sliding-scale applying to the Company has to be modified; and, operating half-yearly, penny changes in price will carry 1s. 3d per cent. variations in dividend. It is proposed that the illuminating power of the gas shall be reduced to 14 candles, tested by the Metropolitan argand burner No. 2, the bar or table photometer, and Harcourt's 10-candle pentane lamp. The discounts clause appears, providing for rebates up to 10 per cent. for prompt payment and 15 per cent. for large consumption. The model clause referring to excess of charge for prepayment supply is inserted. [*Parliamentary Agents: Messrs. Torr and Co.*]

By the Falmouth Gas Act of 1890, it was enacted that the Company's capital should be £18,500, of which £13,500 was to be original stock, and the remaining £5000 additional capital. The borrowing powers allowed amounted to £5000. The original stock is entitled to a standard dividend of 10 per cent. The whole of the additional capital has been raised by the issue (at a premium) of £3330 of preference stock, bearing a dividend of 6 per cent. per annum. The borrowing powers have been exercised to the full by the issue of debenture stock, carrying interest at the rate of 4 per cent. Certain lands are scheduled for gas-works purposes; and the Company desire to have power to purchase, by agreement, up to 10 acres of land. The Company ask permission to raise £15,000 of additional capital, with one-third borrowing powers. The dividend on additional capital issued as ordinary stock is to be limited to 7 per cent. and to 6 per cent. on any portion issued as preference stock; and in reference to additional stock issued as ordinary, the Company's existing sliding-scale provisions are to be read as if 3s. 6d. were substituted for 5s. In their Act of 1890, the Company were authorized to create an insurance fund not exceeding £750; but the usual insurance and renewals fund clauses appear in the Bill. For the purposes of the Act of 1890, the Company propose the adoption of the Metropolitan argand burner No. 2. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Gas Companies' (Removal of Sulphur Restrictions) Bill is on all-fours with that promoted last year, excepting that, in the preamble, it is mentioned that relief was obtained last session by a group of Suburban and Provincial Gas Companies. The seven Companies who are parties to the present Bill are the Bath Gas-light and Coke Company, Blyth and Cowpen Gas Company, Eastbourne Gas Company, Scarborough Gas Company, Tynemouth Gas Company, West Ham Gas Company, and Weymouth Consumers' Gas Company. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

In the joint Bill of the Great Yarmouth Water Company and Lowestoft Water and Gas Company which deals chiefly with water supply and capital powers, the last-named Company have inserted a clause (after the ordinary form) to give them permission to contract for a supply of gas in bulk beyond the limits of their supply district, upon such terms and conditions, and for periods not exceeding in any case seven years, as may be agreed upon. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Maidstone Gas Company's Bill is not an extensive one; but it is full of interesting matter. In the first place, they are asking for an extension of their limits, so as to include a number of parishes and places adjacent to their present supply area. In these parishes and places, the Company ask for the right to charge a special rate of 6d. per 1000 cubic feet over and above the price, under like circumstances, to consumers outside the borough of Maidstone and a radius of 1½ miles from the Maidstone Town Hall. But the prices so charged are not to be taken into consideration in ascertaining the price charged by the Company for the purpose of fixing the dividend payable under the powers contained in the Company's Act of 1903. The Company are also, in accordance with the legislation of the past two years, asking for exemption from liability to any penalty or forfeiture by reason of the presence in the gas of sulphur impurities other than sulphuretted hydrogen, and, following upon this, the repeal of section 40 of the Act of 1880. It is also proposed that the illuminating power of the gas shall be 14 candles, tested by the Metropolitan argand burner No. 2, a table photometer, and the Harcourt 10-candle pentane lamp. As a matter of domestic convenience, the Company ask that it be enacted that, from the passing of the Act, any transfer of capital stock may be in multiples of £1, so long as, by such transfer, no holding of any stockholder is rendered less than £10 of stock. Notice of the effect of this enactment it is intended shall be stated on all stock certificates. Compulsory purchase of certain lands is required, and, by agreement, lands to the extent of 5 acres. The Company also contemplate the construction of a single line of tramway, 6 chains or thereabouts in length, and 4 ft. 8½ in. gauge, starting from the South-Eastern and London, Chatham, and Dover Railways and terminating in the Company's works. The tramway is required for use solely for the purposes of the Company; and the motive power is to be animal power or a winding engine and rope. If the tramway is not completed within five years, the powers will cease, excepting in regard to so much as is completed. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Mitcham and Wimbledon District Gas Company do not appear to have had to trouble Parliament much. In the preamble of the Bill which they are promoting in the present session of Parliament, their Act of 1867 is mentioned and a Provisional Order of 1892. The present Bill will bring the Company's powers up to date, and give them extended ones. In the first place, the Company desire the repeal of the proviso of section 5 of the 1892 Order, which prohibits the use of certain land for gas manufacture or the conversion or storage of residuals. They also ask for purchase powers, by agreement, of certain parcels of land, two of which combined make between 8 and 9 acres, and a couple of smaller pieces. They further request authority to hold powers of purchase by agreement of land, not for manufacturing purposes, to the extent of 10 acres. A scheme of conversion and consolidation of capital is incorporated in the Bill. The consolidated ordinary stock is to bear a standard dividend of 5 per cent. The original capital, carrying a dividend of 10 per cent., to the amount of £100,000 is therefore to be converted into £200,000 of ordinary consolidated stock; and £80,000 of the 1867 additional capital, bearing a dividend of 7 per cent., is to be converted into £112,000 of consolidated ordinary stock. Power is sought to raise £300,000 of additional capital, and one-third borrowing powers. A standard price of 3s. 6d. is asked for, with a sliding-scale, operating half yearly, on the basis of penny changes in price varying the dividend by 1s. 3d. per cent. It is proposed that the illuminating power of the gas shall be 14 candles, tested by the Metropolitan No. 2 burner, the bar or table photometer, and Harcourt's 10-candle pentane lamp. Authorization to insurance, renewal, and reserve funds is desired. As is commonly the case now, the Directors seek power to themselves alter the remuneration of the Secretary. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

In the Bill promoted by the Worthing Gas Company, lands are scheduled for purchase by agreement for manufacturing and storage purposes; and powers to purchase land, by agreement, for other purposes up to 10 acres are sought. It is desired that the limits of supply shall be extended, so as to include the parishes of Durrington and Goring. A scheme for the conversion and consolidation on a 5 per cent. basis of the ordinary stock and shares is included in the Bill; the distribution to be at the rate of £200 of consolidated stock for £100 of ordinary stock, and £14 of consolidated stock for every ordinary share. The unexercised powers in relation to the issue of shares or stock under the Company's Provisional Order of 1904 are to cease on Jan. 1 next; and the Company limit themselves to an issue of £7000 before that date. The additional capital sought is £100,000; and including £22,550 now owing on mortgage of the undertaking, the Company ask to be authorized to borrow to the amount of one-third of the nominal amount of the ordinary stock into which the ordinary capital is consolidated, and one-third of the issued amount of the additional capital. Dividends on preference stock are not to be larger than 6 per cent. With the conversion and consolidation of the capital, the necessary changes are made in the operation of the sliding-scale. A renewals fund is also provided for. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bills promoted by local authorities, with one exception, are not of great importance so far as gas powers are concerned.

Part of the Brighouse Corporation Bill deals with gas and electricity; but the clauses are common ones. It is worthy of note that the promoters are purposing to remove the title of persons to demand a supply of electricity where there is a separate supply, unless the consumer has previously agreed to pay to the Corporation such a minimum annual sum as will give a reasonable return on the capital expenditure, and will cover other standing charges incurred by the Corporation to meet the possible maximum demand for the premises. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

In the King's Norton and Northfield District Council Bill, it is seen that they are anxious to set up gas-testing places within the district for the purpose of testing the gas supplied by the Corporation of Birmingham or other body empowered to supply

gas in the district. The testing is to be governed by the Act of 1871. [*Parliamentary Agents: Messrs. Bircham and Co.*]

The most interesting of the Local Authority Bills in respect of gas supply is, of course, that of the Kingston-upon-Hull Corporation, in which they are applying for authority to purchase the undertaking of the East Hull Gas Company, who supply in Kingston-upon-Hull and in the parish of Sutton. The preamble of the Bill sets forth the fact that, in the Company's Act of last year, it was enacted that, if the Corporation "should introduce a Bill into Parliament in the present session, for an Act to empower them to purchase the undertaking of the Company, nothing in that Act contained should be deemed to prejudge or prejudice, one way or the other, the question of such purchase, and that, in the event of such Bill becoming law, the value of the undertaking should not be enhanced or depreciated by the passing of the said Act of 1906, or by anything contained therein." Mention is also made of the fact that the Corporation, under an Act obtained in 1897, purchased the undertaking of the Kingston-upon-Hull Gaslight Company, who were supplying gas in another part of the city. The Corporation therefore submit the expediency of the undertaking of the East Hull Company being transferred and vested in them. The Bill is an "omnibus" one; and it is Part II. that provides for the purchase and sale of the concern. If Parliament endorses the application of the Corporation, the price to be paid for the undertaking is to be fixed by agreement or arbitration. But it is provided that, in determining the price, the value of the undertaking is not to be enhanced or depreciated by the passing of the Company's Act of last year; and that—

No allowance shall be made for compulsory sale; but the arbitrator, arbitrators, or umpire who shall determine such price or consideration (in this section called the Court) may make such allowance as they think just for recoupment of any loss of interest pending reinvestment, as well as for the cost of reinvestment, and for covering any costs, charges, and expenses (other than costs incurred in any arbitration under this Act) which have been, or are likely to be, incurred in consequence of the passing of this Act by the Company or the stockholders therein, and which ought, in the opinion of the Court, to be borne by the Corporation.

The Corporation also provide for the payment of all moneys that the Court shall deem to have been reasonably expended by the Company in obtaining their Act of 1906. Notice to purchase the undertaking is to be served within six months after the passing of the Act. Authority is asked to the compensation of officers in the regular employment of the Company who shall not be retained by the Corporation, or be given by the Corporation the opportunity of remaining in the same or similar office, and at the salary and on the terms and conditions in, at, and on which they were employed by the Company prior to Oct. 1 last. All the necessary powers referring to the transfer and winding up of the Company are incorporated. Clauses in the Bill adopt as much of the Company's parliamentary powers as are applicable to the carrying on of the undertaking by the Corporation. Powers are included for the raising of the necessary money required in connection with the purchase, and (with the consent of the Local Government Board) any further money that may be needed. The term requested for the repayment of the money associated with the purchase is fifty years. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

The Penrith District Council have a large Bill in Parliament, composed of several parts and dealing with a variety of matters. Part IV. refers to the gas undertaking. It is contemplated to extend the limits of supply to include a number of parishes in Cumberland and Westmorland. A limit of 5s. is put upon the price of gas within the district, and 6s. within the remainder of the limits of supply. The model clause referring to excess charges in relation to prepayment supply is adopted. The illuminating power of the gas is named at 14 candles, tested by the "Metropolitan" argand burner No. 2, a bar photometer, and Harcourt's 10-candle pentane lamp. Quite a number of other modern provisions connected with administration are to be applied. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

In Part III. of the Pontypridd District Council Bill, are a number of modern clauses affecting the conduct of the gas undertaking; among them being one prescribing the illuminating power of the gas at 14 candles, and its testing by the Metropolitan argand burner No. 2, the bar or the table photometer, and Harcourt's 10-candle pentane lamp. In the part of the Bill referring to finance and rating, an amendment of section 30 of the Council's Act of 1893 is proposed, so that the maximum amount of the reserve fund of the gas undertaking may be one-fifth of the aggregate capital expenditure, instead of £3000. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

Gas-Engines for Driving Dynamos.—The Boston Elevated Railway Company have been trying gas-engines for the past few months for dynamo driving, and the experiment has been fully justified. Only one of the stations has been in continuous operation long enough to obtain reliable figures; and this was of but 700 kilowatt rated capacity. According to the "Street Railway Journal," the results, working under service conditions for four months, give 1·45 lbs. of coal per kilowatt-hour on an engine load-factor of about 74 per cent. During a 50 days regular test, when the plant was running 16 hours a day on Pocahontas coal, this average fell to 1·31 lbs. per kilowatt-hour. Taking these facts at their face-value, they correspond in fuel economy with a steam plant giving 1 kilowatt-hour on about 12 lbs. of steam.

A CONTRAST IN SUCTION-GAS TRIALS.

[Communicated.]

The report of the Royal Agricultural Society's trials of suction gas plants made at Derby (referred to in the "Journal" for the 25th ult.), deserves more than passing notice, in the light of similar tests made at Glasgow twelve months earlier, and upon which some remarkable claims were based. It will be remembered that the latter trials were conducted under conditions which were in every way favourable to the working of the plants; and, apart from the mere consideration of their utility for ordinary every-day use, they thus afforded interesting, although not very useful, data as to their possibilities when on their best behaviour and in the hands of competent nurses.

Note the conditions from beginning to end. Nothing better could possibly have been devised on behalf of the makers. Scotch anthracite coal of good quality was used as fuel, possessing at the same time the advantage of a low initial price. In each test the time of starting was taken when the producer was in action and filled with fuel at a predetermined level (the ashes and clinker having been, as far as possible, previously cleaned out), and with the engine working steadily at a stated load. At the end of the test, the producer was brought back to practically the same condition, and the fuel consumption was determined from the amount introduced during the test. The fuel was at the beginning of the test consolidated by working it from the top with a poker, to lessen the chance of any arches or hollow places forming in the generator, and thus to some considerable extent ensuring a uniform quality of gas. All unburnt fuel extracted during clinkering operations was carefully picked out and returned to the producer. The tests were run for a period of ten hours only; and two men were allowed as attendants in each case.

Under these and other favourable conditions it was, of course, to be expected that, as the report states, "the results of the trials were most satisfactory, and the economy, efficiency, and simplicity of the working of the suction gas producer plant demonstrated beyond question." The report goes on to say: "On the combined trials at full and half load (20 hours altogether), the average coal consumption for all the plants was about 1 lb. of coal per B.H.P. per hour, costing about $\frac{1}{20}$d.—coal at 9s. 3d. per ton. This is a most remarkable result; it means that an engine developing 20 B.H.P. can be run at a cost of 1d. per hour."

By way of contrast, and in face of this "remarkable result," it is interesting and useful to turn for further data to the more recent trials of suction-gas plants at Derby. These were obtained under conditions—excepting as to skilled attendance and other obvious features—more comparable with those which would obtain in ordinary day-to-day work. In the trials, regard was paid to the general practice followed in the case of a producer plant doing constant work—that of starting the fire on Monday morning, banking down each night, and cleaning out on Saturday. At the end of each trial, the partially consumed fuel was examined and weighed, and presumably credited to the fuel account. Both producer and engine were entirely in the hands of representatives of the exhibitors.

From tests under these certainly fairer, though, as the report admits, not "the best conditions," the fuel consumptions of a good suction-gas plant, when working continuously, were found to be as follows: 1·1 lbs. of anthracite per B.H.P. per hour full load, and 1·6 lbs. half load. The consumption of water was: 1 and $\frac{3}{4}$ gallon per B.H.P. hour respectively. Therefore, to adopt the phrasing of the Glasgow report, "on the combined trials at full and half load, the average coal consumption" was about 1·35 lbs. of anthracite coal per B.H.P. hour. This, including as it does stand-by losses, is a very different figure from the claim of 1 lb. Speaking of the included stand-by losses, it is to be noted that these are as low as they are likely to be. The hopper and firedoors of each producer were sealed up at the close of the day's work. The plant being new, such sealing can be regarded as practically perfect. Some allowance should, therefore, be made for infiltration of air, and consequent partial combustion of fuel, after expansion and contraction have had their effect upon the close fitting of the furnace frame and door.

Several points referred to in the Derby report were obviously difficult to adequately settle or investigate; but, being possible factors in the ultimate working costs, they could not be ignored. These covered the questions of immunity from "scaling" troubles, which may arise from the use of hard water; the readiness with which the producer will respond to all kinds and conditions of varying loads, since, in the case of a change from light to full load, the quality of the gas, being comparatively poor, will not at once give the desired power; the nature and extent of the attendance required; and similar points. The matter of attendance could not be considered decided by the so-called "novice" trials. The plants under test were necessarily in good working order, having previously been in the hands of the makers' representatives. As with all plants, it is after a certain amount of wear and tear that the unexpected happens, and tries the ability of the unskilled attendant. The report admits that, although "less manual labour is required than in the case of a steam-engine, more intelligent care is necessary to ensure the production of gas of good quality." The further question of reliability was mentioned; but the short duration of the trials could not

warrant a definite opinion. It was noted, however, that an existing plant had been running continuously "for three months," and the furnace found on examination to be satisfactory, having very little clinker adhering to the brickwork.

The trials of the Royal Agricultural Society have undoubtedly been made as fairly as the circumstances would allow. They point to the undoubted usefulness of suction-gas plants, and furnish evidence of their possibilities as one source of cheap power. These tests, however, upset the startling claim made as a result of the Glasgow trials, adding as they do some 30 to 40 per cent. to the then claimed fuel consumption, and, with anthracite at (say) the not immoderate figure of 24s. per ton, practically making the fuel alone cost about 1·75d. per B.H.P. When the items for water, attendance, stores, renewals, interest, depreciation, and contingencies yet to be determined, are all added, the cost of suction gas per B.H.P. per hour will scarcely be a figure with which a progressive town gas undertaking cannot compete.

The data of the coke fuel trials (the fuel consumption being only 1·3 lbs. per B.H.P. per hour for full load) are encouraging in spite of the statement that coke is more difficult to deal with than anthracite in consequence of the occasional deposition of tar on the valve-seats. The difficulty can surely be overcome to some extent by the purchase of well carbonized and screened coke, or some provision made in the design of the producer to allow of the use of ordinary coke. The fact that coke is usually easily procurable and comparatively cheap should make this a point worth attention.

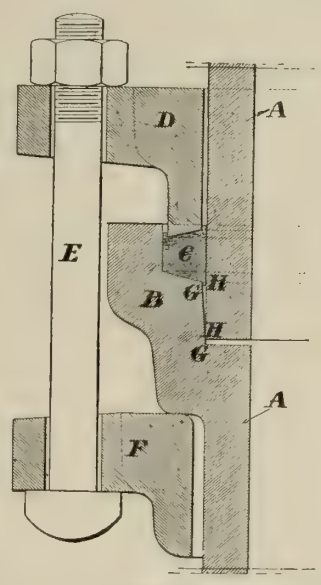
The average price of the two prize-winning suction-gas plants and engines at Derby were £11 16s. per declared B.H.P; while the average of the same makers' plants at Glasow worked out at £9 15s., of which £4 was the price of the producer plant itself.

GAS SUPPLY TO PARIS SUBURBS.

A Large Main-Laying Contract.

Those of our readers who may have followed the history of the gas supply of Paris, as recorded in our columns, will doubtless remember that, in view of the termination, on Dec. 31, 1905, of the concession of the Paris Gas Company, which embraced not only the city but most of the surrounding places, a Company was formed in 1903, under the title of the "Société d'Eclairage, Chauffage, et Force Motrice," to ensure the supply of gas to the portions of Paris beyond the jurisdiction of the Municipality. The suburban communal authorities associated themselves with the view of treating directly with a concessionary, independently of the decision of the Paris Council (then in abeyance) as to the future *régime* of the gas supply; and the result was that the above-named Company obtained a concession for thirty years, dating from Jan. 1, 1906, for the supply of 72 communes. As soon as the preliminary arrangements were settled, steps were taken to erect the necessary works; and these were in due course put up at Gennevilliers—a locality on the banks of the Seine, to the north-west of Paris, which is not generally resorted to by visitors, inasmuch as it is the site of the world-renowned works for the treatment of the City sewage. The gas-works were described in the "Journal" for the 2nd of January last year, and in the number for the 23rd of that month we illustrated (p. 223) one of the gas-holders, of which there are four—two on the works, and the others at Boulogne-sur-Seine and Alfortville, lying respectively to the west and south-east of Paris. These, of course, had to be connected with the new works, and some extensive main-laying operations were necessarily involved. Some particulars in regard to these we now give, as supplementing those describing the manufacturing and storage plant which have already appeared.

The contract for supplying and laying the mains was placed with the Société Anonyme des Hauts-Fourneaux et Fonderies de Pont-à-Mousson, on Feb. 6, 1904; and its conditions were very stringent. In the first place, the mains from which branches were to be taken were to stand a pressure of 30 centimetres (12 inches) of mercury, and those to be used as carriers only, a pressure of 45 centimetres (18 inches). In order to ensure soundness, the contracting Company designed a special joint, the nature of which will be seen from the accompanying illustration. It consists of an ordinary cylindrical pipe A, having at one end a socket of special shape B, into which a square india-rubber washer C is compressed so as to seal the joint. Tightening-up is effected by means of a compressing counter-flange D, supported by means of bolts E on a second flange F behind the socket. The features of the system are that perfect centring is ensured



The Gennevilliers Pipe-Joint.

at the time of making the junction—*i.e.*, when the end of a pipe is inserted in the socket of one already laid—and that regularity of joint is obtained by means of the slightly conical form given to the part of the socket marked G, whereby the end of the other pipe H is guided. This method of jointing ensures an equal distribution of pressure on the india-rubber washer, and a maximum of soundness. Moreover, there is but slight contact between the washer and the gas in the main. The pipes were tested in groups of forty lengths over a period of 44 hours without showing any fall of pressure.

Another point on which the contract was very stringent was the completion of the work to time. The task undertaken by the Company was by no means a light one, for the roads in the suburbs of Paris are encumbered, as they are here, both above and below the ground, with tramway-lines, water-pipes, electric cables, sewers, &c. In addition to these impediments to rapid progress, there was a strike among the navvies. Nevertheless



Fig. 1.—The Three Mains as they leave the Gennevilliers Gas-Works.



Fig. 2.—Laying the 32-inch Main at St. Ouen.

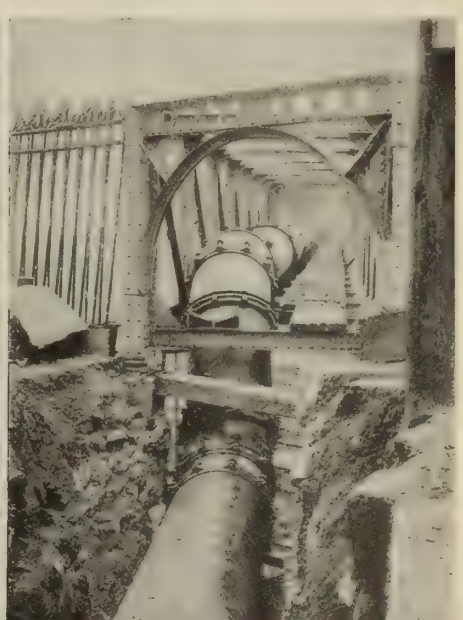


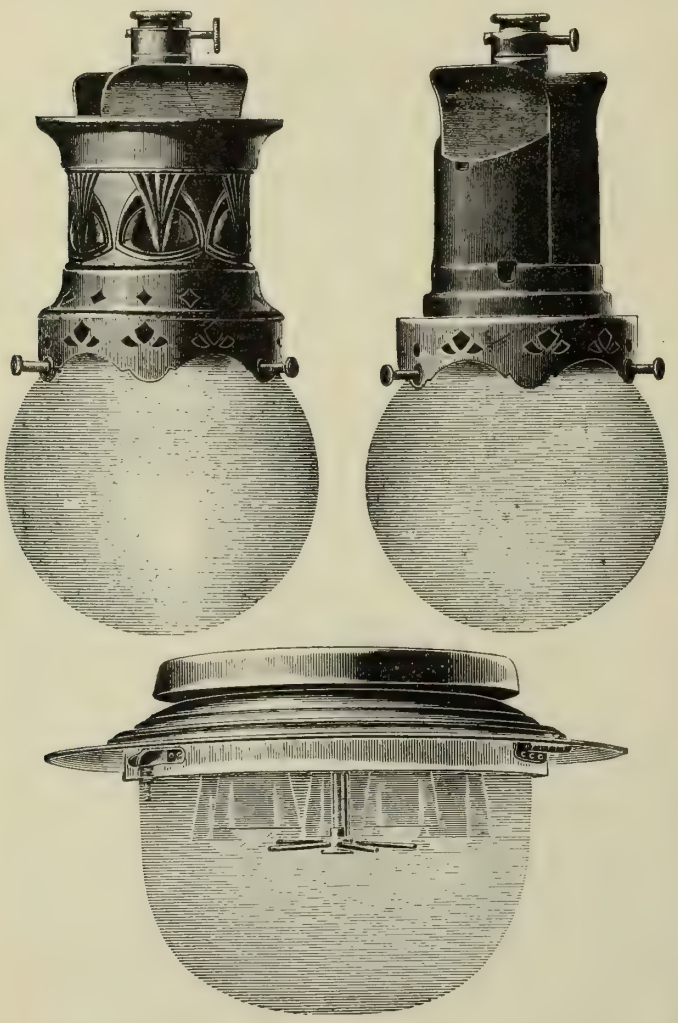
Fig. 3.—The Main as Carried over the Eastern of France Railway.

the contractors gained the premium offered by the Gas Company for completing the work well within the time specified. Our illustrations show the mains in various positions. In fig. 1, three mains are seen at the point where they leave the works at Gennevilliers. The unfinished one on the left is the 39-inch trunk main running eastward to Alfortville; the centre one is a 27½-inch trunk main running in a south-westerly direction to Boulogne, and then eastward to the same terminus as the other; while the third is a 23-inch main feeding the gasholder at Boulogne. Another feeder of the same diameter leaves the works on the north side, and runs in an easterly and southerly direction to Alfortville. The largest main crosses the Seine at a point just below Clichy, where it is reduced to 32 inches in diameter. In fig. 2 the work of laying this section of the main in the Rue du Landy, at St. Ouen, is seen in progress. After a run of about four miles, it is brought down to 28 inches. A further reduction to 23 inches takes place at Pantin, where, as shown in fig. 3, it is carried over the Eastern of France Railway, and goes south. At St. Mandé, it is only a 20-inch main, and it runs in close proximity to the last portion of the north-eastern feeder already alluded to—both ending at Alfortville. The centre main, after a run of about four miles, follows the left bank of the Seine to a point about two miles above Boulogne, where it takes a course almost due east to Alfortville.

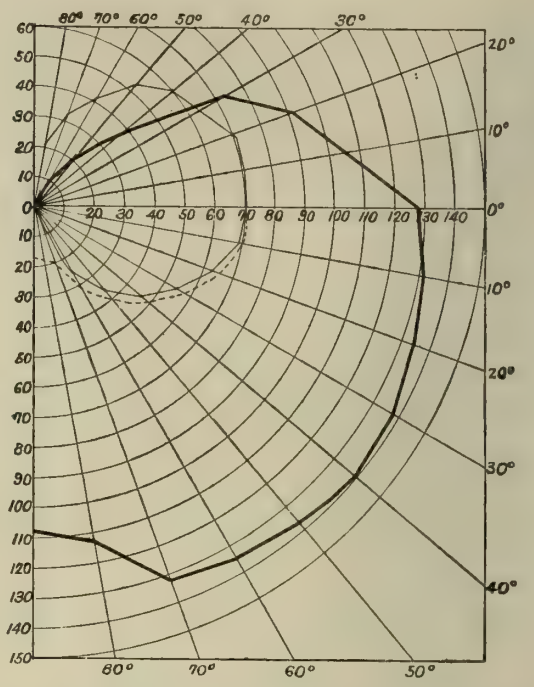
The total length of mains laid was about 67 miles; and the amount of the contract was upwards of 5 million francs. But the Pont-à-Mousson Company have carried out during the past two years other main-laying work for the Gas Company to the extent of 246 miles—the system of jointing above described being employed in all cases.

THE "GRAETZIN" GAS-LAMP.

In the introductory lines to the table of tests of various illuminants in Vienna, which appeared in the "Journal" last week, reference was made to the above-named lamp, which, as shown by the table and the diagram accompanying it, produced higher results than all the other lights tested—giving for 1d. per hour 584·5 candles, compared with 568 candles yielded by the Bremer flame-arc electric lamp. In view of the interest attaching to the



"Graetzin" lamp, which is of Berlin manufacture, we give illustrations of three samples of it, and a diagram showing its capacity as an illuminating agent. The lamp on the left is a single-burner one of 70-candle power; the one on the right is of 100-candle power, without a mantle, and is suitable for the lighting of works; while the lowest one is a five-burner lamp for outdoor lighting. The diagram shows clearly the quantity of light afforded by the "Graetzin" lamp, with a consumption of 3·5 cubic feet of gas per hour, as compared with an ordinary incandescent burner. The thin line is the curve given by such a burner; the broken line shows the result when a reflector is used with it; and the black shows the lighting power of a "Graetzin" lamp similar to that on the right. It will be seen that this lamp throws its light



upwards quite as well as an ordinary burner; while below it the lighting is without shadow. The lamp is a valuable addition to those now on the market; and its high duty ensures for it a place among the best of them.

COAL AND GAS OUTPUT IN ITALY IN 1905.

Our Italian contemporary "Il Gaz" quotes from the "Revista del Servizio Minerario" some figures relating to the total coal and gas output from Italian collieries and gas-works during the year 1905. Although Italy has several valuable minerals, and some small amount of coal, it is well known that there is but very little of the latter of use for gas making, or, indeed, any industrial, purposes. There are 38 mines producing combustible coal, and their total output for 1905 was as follows: Anthracite, 1163 tons; lilanthrax, 575 tons; boghead, 50 tons; lignite, 407,887 tons; and bituminous, 3241 tons—total, 412,916 tons. This represents a value in Italian lire of 3,435,398, which works out at about 8·32 lire (say, 6s. 7d.) per ton.

Italy is divided into ten mineral districts, which are named below; and the respective outputs of gas, coke, and tar of the gas-works in the districts during 1905 were the following:—

Name of District.	Gas. Cubic Metres.	Value of Gas. Lire.	Coke. Tons.	Value of Coke. Lire.	Tar. Tons.	Value of Tar. Lire.
Bologna. .	11,570,000	2,603,250	30,000	1,230,000	2,000	60,000
Caltanisetta	15,345,297	3,448,896	30,287	727,041	2,463	69,865
Carrara . .	26,346,563	3,771,822	66,672	1,840,824	4,296	137,951
Florence .	10,840,738	2,439,058	22,000	614,037	2,747	96,135
Iglesias . .	1,832,500	458,125	3,959	118,770	286	12,870
Milan . .	80,613,381	11,326,116	189,526	5,762,615	12,428	366,386
Naples . .	24,101,290	4,437,997	63,592	1,374,548	3,310	67,991
Rome . .	20,778,827	4,153,836	19,137	1,179,919	3,360	100,800
Turin . .	46,488,254	7,110,200	108,335	3,889,740	7,295	232,145
Vicenza . .	18,881,380	3,654,000	45,476	1,673,075	3,027	94,145
Totals. .	286,798,232	43,403,300	591,984	18,410,569	41,212	1,238,288

The total quantity of gas—namely, 286,798,232 cubic metres—is the equivalent, in round figures, of 10,127 million cubic feet. The value of it per cubic metre is 0·1513 lira, which is, approximately, 3s. 5d. per 1000 cubic feet. The value of the coke comes to 31·09 lire, or about 24s. 7d. per ton; and that of tar reaches 30·05 lire per ton, or nearly 23s. 10d.

Young and Glover's Vertical Retort.—In view of the information which has from time to time appeared in our columns in connection with the Young and Glover patent vertical retort, it is interesting to note that the patentees have arranged with the West Gas Improvement Company, Limited, of Manchester, for the manufacture and introduction of the system in this country and abroad; and it is anticipated that arrangements will be concluded at an early date for the erection of trial installations.

REGENERATIVE RETORT-SETTINGS.

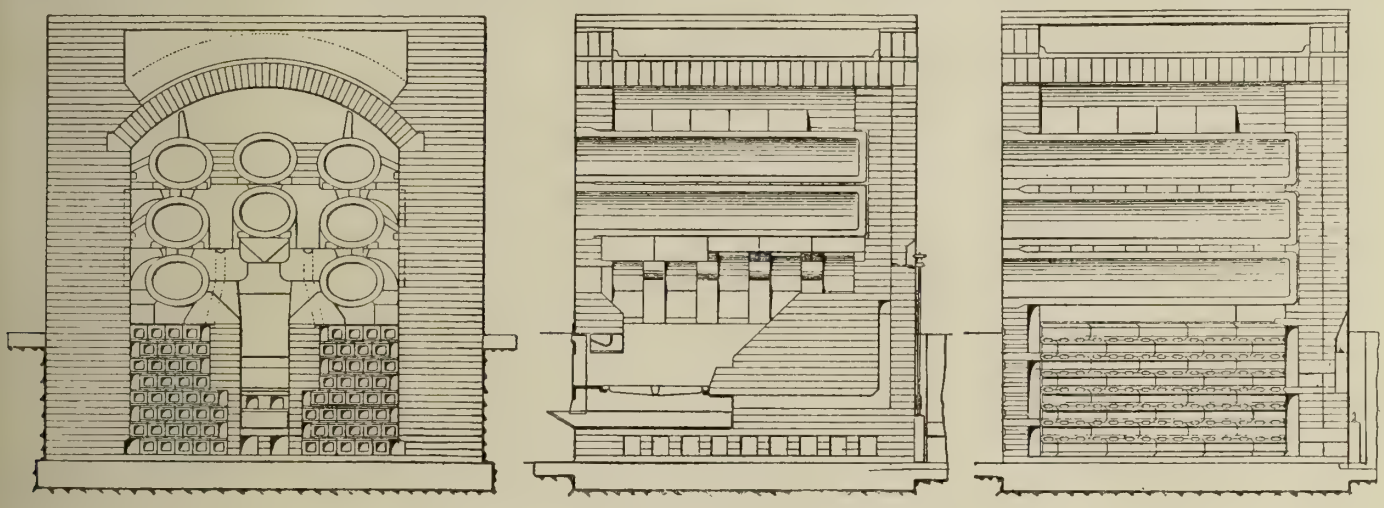
An article upon regenerative settings of gas-retorts, by Herr Hermansen, of Bromölla, was published in a recent issue of the "Journal für Gasbeleuchtung," in the course of which the author also described a new form of fire-clay tube for the construction of compact air-heaters.

Herr Hermansen begins his article by remarking that the employment of gas firing for retorts enables the fuel to be consumed almost completely without the use of a serious excess of air. In the direct firing of furnaces, it is customary to work with double the theoretical quantity of air, so that the chimney gases contain 10 or 11 per cent. of oxygen; whereas only about 1 per cent. is usually to be found in the waste products from a gas-fired setting. Moreover, the losses of heat due to the high temperature of the waste gases are largely avoided by the pre-heating of the air. The economic advantage of gas firing and regeneration has been well pointed out by Dr. Geipert,* and also by Professor Jüptner. The latter compares the phenomena in a direct-fired coal-gas retort-setting working at 1000° C. with those in a Siemens-Martin furnace working at 1600° C. without regeneration. He points out that, if complete combustion can be attained with the use of only the theoretical quantities of air, the losses of heat in the waste gases would reach 43 per cent. and 74 per cent. respectively of the calorific value of the coke consumed; but if the chimney gases contain 5 per cent. of oxygen—*i.e.*, the excess of air being about 50 per cent.—the respective heat losses will be 57 and 91·5 per cent. These figures show clearly how the waste of heat increases with the temperature of the chimney gases.

The retort furnaces employed in coal-gas manufacture at the present time may be divided into three classes: (1) Complete producer furnaces with the sub-structure from 7 to 10 feet deep; (2) semi-producer furnaces with a sub-structure 3 to 5 feet deep; (3) direct-fired furnaces with a sub-structure only 6 to 18 inches deep. So far as the author is aware, the best results in the matter of fuel consumption are obtained in an 8-retort setting with a deep regenerator, the quantity of coke burnt being between 11 and 14 per cent. It seems doubtful whether much better results can be anticipated, because the conditions prevailing vary from time to time, according to the coal carbonized. Apparently the heat required in a retort-furnace to carbonize 100 kilos. of average English coal is about 28,000 Calories; while about 10,000 Calories are lost by conduction and radiation. Altogether the consumption of heat should be about 63,000 Calories; and if the heating value of the coke is taken at 7000 Calories, coke equal to 9 per cent. of the coal carbonized should be consumed in the furnace.

The author has tried the experiment of firing an 8-retort setting for twenty-four hours with the retorts empty and with them normally charged with coal. When properly charged, the fuel consumption was 11·5 per cent., and when empty rather more than a third less; the efficiency of the furnace being about 35 per cent. This shows that the previous calculation agrees fairly with practical results, except that more heat is lost by radiation and in the waste gases. The consumption of fuel in semi-producer furnaces with deep regeneration is usually from 17 to 20 per cent.; and in direct-fired furnaces with shallow regeneration it is generally 22 to 30 per cent.

The questions thus arise whether it is possible to work with a fuel consumption of 11 to 14 per cent. without having to employ large and expensive regenerators under the settings, and what is the most advantageous depth for the regenerators? This is a problem of peculiar interest in all medium-sized gas-works, for a deep regenerator under a setting containing only a few retorts is not only very expensive to erect, but also involves such large and unnecessary losses of heat and other objections, that it is not possible to obtain the same results which are given by a similar furnace of larger dimensions. In attempting to answer the questions, it is first necessary to consider the height of a producer. A producer fired with coke will give a fairly good gas when the fuel is from 2 ft. 4 in. to 3 ft. deep; and the producer having such a depth of fuel must be from 3 to 4 feet tall. The water-trough required underneath is, in the author's opinion, best left open, so that the clinkers may be quenched in it. This method of construction occupies so little space that the waste gases can easily be led under the trough. Since the heat losses from the walls of a setting are proportional to the size, that setting is best and cheapest which, other things being equal, is the smallest. If it be assumed that the dimensions of the upper part of a retort-setting are fixed, and if the combustion chamber is arranged as high as possible, when the producer is constructed entirely under the setting, a sufficient height for the producer, for the water-trough, and for the chimney flue will be available if the sub-structure is from 3 to 5 feet deep—viz., has the same depth as is customarily adopted in a semi-producer setting. It has further to be ascertained whether between a producer and the side walls of the setting there is sufficient space for the construction of a regenerator equal in efficiency to a regenerator built 10 feet deep. When the regenerator is 10 feet deep, the heating surface per 10-foot retort in an 8-retort furnace is generally about 34·4 square feet in a Munich setting, 25·9 square feet in a partially self-contained Hasse-Didier setting, and 23·7 square feet in an entirely self-contained Hasse-Didier setting. Hence the problem is, in the smaller space mentioned above, to construct a regenerator having at least 32·3 square feet of heating surface per retort, and to utilize the whole surface efficiently. The author believes that existing regenerators have two defects: (*a*) Their large rectangular air passages, which do not ensure uniform heating, especially when the regenerators are shallow, and (*b*) the thick side walls and thin covers of the heating passages, which cause losses in heat. He considers, however, that these defects can be wholly removed without in any way affecting the stability and tightness of the apparatus in a manner which simultaneously increases the heating surface per retort for a given amount of space occupied.



The Pintsch-Hermansen Regenerator.

The Pintsch-Hermansen Regenerator.

The method employed by the author in constructing his regenerator is shown in the three accompanying diagrams. The essential feature of the apparatus is a rectangular pipe of fire-clay provided with a spigot end of reduced diameter, which fits into a flush-socket on the next pipe. The pipes are disposed within the regenerator space longitudinally from front to back of the setting, as shown in the third illustration; each row being laid upon the lower one, brick fashion, with broken longitudinal joints (see the first figure). The top and bottom surfaces of the pipes are moulded with external transverse grooves, which coincide when the pipes are laid in their proper places, forming shallow rectangular channels, serving for the circulation of the secondary air. As will be seen in the first figure, there is a longitudinal passage left at each outer side of the first, third, fifth, and seventh rows of pipes (counting from the bottom); and similar passages at the inner sides of the second, fourth, sixth, and eighth tiers. The secondary air enters by the two lowest of the side channels, passes convergently through the grooves between the two lowest rows of pipes until it reaches the lowest central passages; then it travels divergently between the second and third rows of pipes, and so on until it arrives at the two central passages in the uppermost tier, whence, by channels indicated by dotted lines in the first figure, it is led to the combustion chamber. The combustion products pass downwards from front to back and from back to front of the setting through the main spaces in the pipes—thus travelling in the opposite direction to the secondary air. Finally the waste gases reach the front end of the setting, descend under the

* See "Journal," Vol. XCVI., pp. 458, 823.

water-trough, and pass away to the chimney flue. The front wall of the regenerator is built of the same pipes as the interior; the mouth of each being closed with a fireclay plug. Hence, without interfering with the action of the apparatus, the passage ways can be cleared of obstruction by pushing a suitable rod through them from the front; the dust, &c., collecting in cavities at the back, whence it can be removed through soot-doors.

A regenerator constructed on this system to a depth of about 4 feet contains a heating surface of 58 square feet per retort—*i.e.*, 40 to 70 per cent. more than is given by ordinary regenerators 10 feet deep. In other words, its heating surface per unit of space occupied is five times as great as that of other regenerators; while the conduction is more perfect, and the entire apparatus is stronger and more simple. It will be seen that the whole regenerator consists of a compact mass of fire-brick, which is so strong that it helps to support the retorts and causes the weight of the setting to be uniformly distributed over the ground.

Some Practical Results.

It may be of interest to quote some results which have already been obtained in practice with the Pintsch-Hermansen regenerator. In April, 1905, a 4-retort setting was experimentally erected for the Municipal Gas-Works at Holbäk, in Denmark, on the ground-space formerly occupied by an ordinary direct-fired bench. The dimensions were 7 ft. 6 in. wide, with the regenerator 1 ft. 4 in. deep and a 2 ft. column of fuel. In order to investigate the strength of the setting, it was fired up and allowed to cool three times, and was next worked continuously for eight months. The setting was then demolished, in order to examine the condition of the regenerator. It was found to be in perfect condition and absolutely tight; the various passages having remained unobstructed, though never cleaned out. The average consumption of fuel was 16 per cent. Shortly afterwards, the proprietors of the gas-works gave an order for two 8-retort settings and one 6-retort setting of the same kind. These were built 9 ft. 3 in. wide, with regenerators 4 ft. 6 in. deep. They were first fired up in November, 1905, and have remained at work without interruption to the present day. A test carried out in December, 1905, showed the fuel consumption to be 13·9 per cent.; during the month of February, 1906, it was 13·56; and in June, 1906, it had fallen to 11·5 per cent.

About the end of 1905, a 6-retort setting of the same description was built at Braunberg, in East Prussia; the setting being 9 ft. 8 in. wide, with a regenerator 4 ft. 6 in. deep and a 4 ft. column of coke. A test was carried out at the end of January, 1906, showing the fuel consumption to be 11·4 per cent. A further report upon the behaviour of this plant during two days in February was handed to the builders by the owners of the gas-works. It was stated that 8921 lbs. of English coal were carbonized in 23 hours, from which 44,700 cubic feet of gas and 6290 lbs. of coke were obtained. The gas made per retort per hour was thus 324 cubic feet, and was equal to 11,200 cubic feet per long ton. The yield of coke was 70·5 per cent. The amount of coke burnt in the producer was 1062 lbs., equal to 11·5 per cent. of the coal carbonized. The report stated that the setting had remained under fire for three months, giving extreme satisfaction.

These figures show that, with a Pintsch-Hermansen regenerator, 3 or 5 feet deep, as good results can be obtained as with an ordinary complete regenerator 10 feet deep. The author is therefore fully convinced that the adoption of his system of constructing a regenerator would be of the greatest value to the proprietors of medium-sized and small gas-works, because, without modifying the space occupied by the old settings, or altering the fittings already employed, it would enable results to be obtained which have hitherto been only possible in large factories having benches of full dimensions.

Regenerators of the author's invention have already been built, or are in process of construction, for ten gas-works in Germany, sixteen in Denmark, eight in Sweden, two in Russia, one in Austria, and five in Holland and her colonies. Of these forty-two gas-works, fifteen already contain regenerative furnaces at work, all of which give entire satisfaction; while from certain places repeat orders have been received.

The advantages claimed by Herr Hermansen on behalf of his regenerator may be summed up as follows: (1) A regenerative setting can be erected in any available space. (2) Per unit of volume, the heating surface of the regenerator is five times as great as that in any setting hitherto constructed, and this causes a considerable economy in the fuel consumed. (3) All the smoke passages are easily accessible for purposes of cleaning while the plant is under fire. (4) The secondary air travels very slowly in thin layers through the appropriate channels, and therefore it is preheated to a very high temperature. (5) The regenerator consists of compact blocks of masonry well bonded together longitudinally and transversely, so that the whole structure is strong and the foundations are uniformly weighted. (6) Even when rapidly driven, the producers only require clinkering every two or three days. (7) The excellent system of firing, and the high temperature of the secondary air, render the combustion practically complete. (8) The special advantage of the author's design is the fact that his regenerative setting can be erected in any old bed space, even on the spot previously occupied by a direct-fired furnace. It should also be added that, by the employment of a Pintsch-Hermansen regenerative furnace, gas-works of even the smallest size effect notable economies in their working expenses without being involved in a heavy capital outlay.

DISCHARGING COKE FROM VERTICAL RETORTS.

There has lately been published the specification of a patent taken out by the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris, for a device to discharge coke from vertical gas-retorts mechanically. The arrangement is shown in the accompanying illustrations.

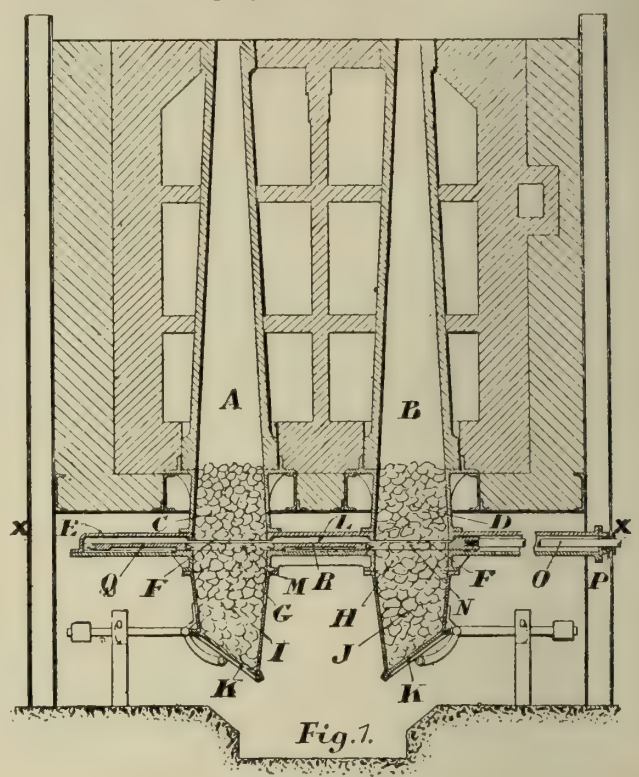
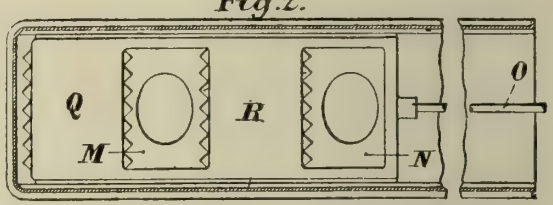


Fig. 1.

Fig. 2.



It will be seen that the retorts A B are prolonged at the base by extension pieces C D, which are connected to the upper part of a horizontal rectangular box E; the lower part F opening into two receptacles G H, similar to the extension pieces C D. The bottoms of the former are furnished with mouthpieces K. In the box E are spaces through which runs a slide L having openings slightly larger than those of the extension pieces and the receptacles below them. The solid parts Q R of the slide are a little wider than the receptacles below, so that the latter can be completely covered, in order to prevent coke falling and air entering when the hoppers I J are opened. Reciprocating motion is given to the slide by means of the rod O, which passes through a stuffing-box at P. There are rows of teeth on the edges of the solid parts of the slide, as shown in fig. 2, which is a horizontal section on the line X of fig. 1.

The action of the mechanism is as follows: When carbonization is going on, the slide is moved slowly backwards and forwards; the result being that the openings M N and the solid parts of the slide pass successively under the openings in C D in such a way that the base of the column of coke rests sometimes upon the mouthpiece K and at others upon the solid parts of the slide, according to the position this occupies. When the slide is moved in one direction, it engages with the two rows of teeth, and divides the columns of coke into two parts. As the solid portions of the slide cover the receptacles G H, the coke in the latter can be discharged by simply opening the mouthpieces K. The operations of interception and separation of the column of coke are performed by merely moving the slide in opposite directions.

Checking Picketing and Intimidation.—In view of the liberty conferred by the Trade Disputes Act upon labour organizations to picket in unlimited numbers for the purpose of "peaceful persuasion," the Labour Protection Association have taken steps to protect masters and free workmen by providing the members with an adequate number of experienced men, who have served in the military, naval, or police forces, to undertake the watching and counter-picketing of factories, workshops, and all places where work or business is carried on which may be picketed by the agents and emissaries of the Trade Unions.

VALUE OF PHOTOMETRY.

At a recent Meeting of the Leeds Section of the Institution of Electrical Engineers, a paper on "Practical Photometry and Its Value" was read by Mr. Haydn Harrison. The following remarks on the subject are taken from an abstract of the paper which appeared in the "Electrical Times."

Practically all photometry has come down to testing for equality of illumination with two lights at different distances or angles. A trouble arises of judging what is equal illumination when the two lights are not of the same colour. This has been largely overcome by the evolution of the "flicker" photometer, which, though depending on the same principle as the others—viz., the balancing of two illuminated surfaces—does not depend for its accuracy upon the judgment of the operator to nearly the same extent, since it relies on a different optical effect; that is to say, the decision as to whether the screens brought alternately before the eye do or do not produce the appearance of a flicker. For this reason, such a photometer will be found more accurate for general work, even when measuring the light-value of lamps of similar spectrum; and when lamps having dissimilar spectra are being compared, only an expert can obtain results of any value without it.

As regards a standard lamp, the author says the best for practical purposes is an ordinary carbon lamp of low efficiency with a big bulb; but after being run 200 hours continuously to condition it, it should be only used to check sub-standard lamps. These are the lamps used in actual work. On the other hand, sub-standards of much more permanent candle power—such as the Osram lamp—can be used for this purpose. The choice of a sub-standard for continuous use depends on whether it is for general testing of any type of lamp, or for testing carbon lamps only. In the former case, an osmium or an Osram lamp on a small secondary battery circuit is much the more reliable and convenient. In the latter case, a carbon lamp of similar voltage is the most satisfactory. A low current lamp, having a positive temperature co-efficient, connected to a comparatively large capacity secondary battery, is probably the most reliable light standard that has ever been produced.

On the question of the proper form of head, the author says that if the argument of the survival of the fittest were the only point to be considered, it would be unnecessary to go into the matter in detail. But, in commercial photometry, elaborate and expensive heads, such as the Lummer-Brodhun and the Simmance-Abady are neither necessary nor advantageous. Of simple devices, he says that for use with a straight bench the bunsen disc photometer remains the most satisfactory arrangement for testing lamps of similar spectra; but a Joly diffusing screen can also be used with good results. As regards flicker heads, as far back as 1896 Whitman described in the "Physical Review" a very satisfactory arrangement of flicker photometer, the advantages of which do not appear to have been fully appreciated until a much later date. The author says that, after considerable experience with both the Whitman and the Simmance-Abady heads, he has come to the conclusion that there is little to choose between them; but, as the Whitman is not a patent, and so can be made in any form most convenient for the purpose, he has used it in the latest type of instrument.

The principle of all flicker heads is the same—viz., to bring the surfaces illuminated by each source of light alternately before the eye. In the Whitman arrangement, this is done by having one fixed screen on which one source of light shines, and one rotating sector disc on which the other light shines at the time when it intercepts the view of the fixed screen. In the Simmance-Abady head, the rotating disc is replaced by a solid block of dead-white material, of which the periphery is turned up so as to bring alternately before the eye surfaces illuminated from either source. Mr. Lancelot Wild's arrangement consists of a rotating disc, one half of which is opaque and reflecting, the other half translucent and diffusing; and it therefore works in the same way as the "grease-spot" photometer. The advantages of the latter are thus combined with those of a flicker photometer.

It will be admitted that competition between gas and electric lighting has reached a stage when slipshod methods of gauging their respective efficiency and cost should be done away with. There is little doubt that modern gas-mantles, especially when raised to the temperature which is possible by means of the various high-pressure systems, have a very high initial candle power; but it diminishes. Therefore, if periodic photometric measurements are made *in situ*, it will be found that the mantles are not the serious competitors they are often imagined to be. Moreover, if tests are continually being made before the eyes of the public, they will soon begin to realize that there are means at their diposal by which they can ascertain whether or not they are receiving value for money. Thus will the supply of gas or electricity for lighting be reduced to a common basis on which the merits of each can be considered by the public, who will hasten the verdict which will result in the survival of the fittest.

Since the publication of the above, the following description of the Harrison "Universal" photometer has appeared in the "Electrical Times."

The instrument is very similar in design to that devised by Messrs. Preece and Trotter, with the exception that it is provided with a flicker head, on the Whitman principle, and is therefore suitable for measuring light of a colour differing considerably from the standard lamp. In order to make the instrument portable and compact, the photometer-bar and sliding-lamp are replaced by a reflecting screen the angle of which is varied. The component parts of this instrument are a flicker-head, which includes a sector in the form of a disc driven by an air-blast; a reflecting screen attached to a pointer, which gives it the necessary angular motion and indicates the angle; a mirror by which the degree of illumination of the screen can be observed through the telescope; a battery; and a standard lamp, There is a plug key for connecting the standard lamp, and a sliding resistance for adjusting the instrument, should the standard lamp change or a new one be required. A tripod stand is provided so as to bring the instrument to a convenient height for making the measurements; and a spirit-level, lens, and quadrant for ascertaining the angle of incidence of the light rays.

The scale is calibrated in candle-feet; and the instrument is therefore an illumination meter. To use it as a photometer, one has only to measure in feet the distance of the light observed, and square that number. Having set up the instrument, all that is necessary is to rotate the sector disc by means of the air pressure bulb provided. The standard lamp having been lighted by inserting the plug, the pointer can be moved until the position is arrived at when the operator can see no flicker. The pointer will then read the illumination in candle-feet at the distance from the light, and the candle power is then obtained by multiplying the figure read by the square of the distance in feet. The only correction required will be due to the lamp being (usually) not level with, but above, the photometer. For this purpose the angle of incidence is measured by the lens and quadrant attached. But this correction need not generally be taken into consideration, if the angle does not exceed 25°; the correction is scheduled on the scale, and, therefore, does not entail much trouble in any event. The designer says the instrument is accurate to within 5 per cent.

EXPERIENCE WITH HIGH-PRESSURE GAS-MAINS.

By Sherwood Grover, of San Francisco.

[A Paper read before the Pacific Coast Gas Association.]

High-pressure gas distribution, though not very old as applied to artificial gas, is no longer an experiment. When we say high pressure, we mean over 2 lbs. per square inch. If one picks up a Cox high-pressure gas-discharge computer, and calculates the capacity of various sized pipes, at gradually increasing pressures, it is liable to lead the imagination into the realm of the impracticable. If, however, at the same time he has a horse-power computer similar in design, and follows these discharge computations with calculations for cost of compression, he will soon realize that there is an economical limit to the practice of transmitting gas under pressure—*i.e.*, there is a point beyond which, under given conditions of cost for power, materials, labour, &c., it will not pay to raise the pressure. Instead of this, it is time to increase the diameter of the pipe, or, with a system already installed, to lay another pipe.

High-pressure systems are of two kinds—one in which the high-pressure mains are simply feeders in the form of arteries running through a district, with regulators connected at intervals to boost up pressure at weak points in the low-pressure distributing mains; or they may be in the form of a loop entirely circling a town, and feeding in at the dead-ends. The other type is where the entire system is high-pressure (varying in degree) with regulators reducing the feeding-main pressure of 20 lbs. or more to a distributing-main pressure of 2 to 5 lbs., and this in turn being reduced by regulators on each house service. The writer does not favour the second type of installation, though there are conditions under which it works very well. He prefers rather low pressure on all distributing mains, not to exceed a 12-inch water column, with no high pressure on the service-pipes. This method allows of using a small, and practically uniform, size of pipe for the distributing-mains in given districts, and is specially adapted to suburban tracts, where consumers are wide apart and main extensions do not pay high returns on the investment.

A high-pressure system can, for convenience, be considered as consisting of three different parts—namely, the compression plant, the storage plant, and the feeding-mains.

The Compression Plant.

The compression plant includes the compressors, their motive power, and the piping system. At this point there is considerable opportunity for difference of opinion as to motive power, type and size of units employed, and arrangement of units. The first is a local question, depending upon the cost of power, together with reasonable insurance against breakdown or interruption of service. In case electricity is used, it is necessary to have either a gas-engine or a steam-engine auxiliary to ensure against interrupted service, or else the storage plant must be of sufficient capacity to bridge over any delay that may occur.

Concerning the type and size of units, it goes without saying that the most efficient compressors should be used; but there are several little points—such as unloading devices, automatic or otherwise—which have more or less merit, depending on the size

of the installation. An automatic unloader is very handy in a small installation; but the writer questions the economy of it in a large one. All automatic unloaders are virtually bye-passes, and bye-passing compressed gas means excessive temperature of the compressor and of the gas being compressed. Unloaders of the pattern used on compressors with Corliss valves, by which the machine can be operated at one-quarter, one-half, three-quarters, or full load, are very useful. They must, however, be used with judgment, and the wear on the compressor should be equalized by changing sides when running at part load, so that each portion of the machine has the same total number of hours' work.

The size of units depends upon the peak-load, unless you are relying on the storage plant to carry you over. Our experience in California has, however, taught us that a unit approximately equal in capacity to the peak hourly output is none too large; and as it is, of course, necessary to have duplicate apparatus, it is well to have the units of varying capacity, so that by running different units during the day it can be so arranged that they are running at full load, and hence at best economy, most of the time.

In the arrangement of units, the writer believes, from observation of several installations, that shafting should be entirely avoided; all units being directly connected with their motive power, and independent of each other. This is advisable on the score of economy in installation and also of operation.

The Storage Plant.

The storage plant consists of a battery of compression tanks, arranged on a suitable foundation, together with the system of piping and regulators connecting them to the distributing-mains. A standard size and type of tank has been adopted by our Company, which was determined by the economy and ease of handling and railroad transport, together with the least cost per 1000 cubic feet stored. This size is 6 feet in diameter by 30 feet in length, with dished heads. It has one manhole fitted with a cover and yoke, one 2-inch reinforced tapped hole which serves as both inlet and outlet, and a 1-inch reinforced tapped hole to be used for a drip-pipe.

These tanks are placed in a row on the foundation—the number depending upon the extent of ground which can be used to best advantage. Other rows may from time to time be added on top of the first, making this installation a flexible one, which can be increased each year at a comparatively small cost to meet the demands of a growing town. One tank, which we call the low-pressure tank, differs from the rest in that it is a distributing and not a storage tank; and although equipped with a manhole and drip connection, like the storage tanks, it also has extra connections, to which are attached the regulators supplying the different feeding-mains of the town.

In large installations, it has been found most satisfactory to carry 20 lbs. or under on the feeding-mains, and hence the main compression units are built for this pressure only. As it is necessary to use 100 lbs. pressure (not less than 80 lbs.) on our storage-tanks, in order to get capacity, it therefore follows that we must have a compressor capable of compressing to 100 lbs. This unit, on account of the nature of its work, can have a very small capacity in comparison with the other machines of the installation; its use being simply to keep the storage-tanks full.

The general arrangement of the compression and the storage plant is as follows: The discharge from the 20-lb. compressors is carried by a single line of pipe to the 20-lb. tank; a branch being taken for suction to the small 100-lb. compressor, so that it may take gas either at 20 lbs. or at the holder pressure, as the case may be. The discharge from the 100-lb. compressor is carried by a single line of pipe to the storage-tanks; a 2-inch connection, with valve, being made to each tank. The same header is continued to the 20-lb. tank, and is connected to it through a regulator and bye-pass. The regulator is set to maintain a pressure less than 20 lbs.—say, for example, 15 lbs. As long as there is 20 lbs. pressure on the distributing-tank, this regulator is shut; but if for any reason the pressure drops, the regulator comes into action, and maintains the pressure at 15 lbs. as long as there is anything in excess of this in the storage-tanks, or the small compressor is able to keep it up. The various feeding-mains of the city are taken directly from the 20-lb. tank, with a separator regulator on each, so that any pressure under 20 lbs. can be carried on any main independent of the others.

In installing a complete plant of this nature, there are many practical points to which attention must be given to avoid trouble. To begin with, the compression-tanks must be handled with care, to avoid subjecting them to unequal strains, which may cause the seams to leak. It is not an easy matter to make a tank injured by failure to observe this point gas-tight after it is in place.

The fittings should be selected with the greatest care, and only smooth, perfect castings used. Porous castings are to the high-pressure pipe man what naphthalene is to the complaint man. Extra heavy fittings, both flanged and screwed, should be used throughout, screwed joints being avoided if possible, and only sockets with taper threads used in straight runs of pipe. The writer favours making everything above 2-inch diameter flanged. Too much care cannot be taken in making up both flanged and screwed joints; and though with a perfect thread it is possible to make a tight joint with red lead, litharge and glycerine mixture is often necessary. In flange joints the simplest, the cheapest, and the most satisfactory gasket has been found to be $\frac{3}{16}$-inch lead wire, soldered into rings with nothing else, although red lead is sometimes used with it. For the manholes on the compression tanks, $\frac{3}{8}$-inch lead pipe makes a very satisfactory gasket.

After considerable experience with valves, it has been found that only extra heavy ammonia valves can be relied upon, and even these at times give trouble. There is one important fact which must be remembered, and that is that a hydraulic test on a valve or stopcock is absolutely worthless if the fitting is to be used for high-pressure gas; both valves and stopcocks of various types have been tested to 250 and 300 lbs. water pressure and were tight; but when subjected to air pressure they failed to hold over 60 lbs., and some even leaked at as low as 30 lbs.

The Feeding Mains.

In the design of the feeding-mains portion of the system, there is considerable opportunity to exercise ingenuity; but at the same time there are certain fundamental facts which should not be overlooked. A high-pressure feeding-main is subject to some of the physical laws which govern the design of a blast-pipe supplying a number of sets of water-gas apparatus; at the same time it is under some of the physical laws governing steam-pipe design. It naturally follows that all sharp turns should be avoided, using instead easy curves and long sweeps. It is even well to substitute Y-fittings in place of crosses or tees, where branches are taken from the main feeders. For joints, patent couplers have been adopted. They are used with plain end pipe, so that at points where branches are taken from the main feeders, or regulators installed, a change-piece is used which has a flange at one end and a coupling on the other. This is made up to the flanged fitting Y, cross, or tee, as the case may be, and a valve placed on the branch or branches, so that the testing of the line, which is carried on regularly with the work so that no pipe is covered till tight, need not be interrupted. All work is tested to not less than 100 lbs. per square inch. A feeder also ends with a valve.

In laying the line, care must be taken to properly anchor and brace all curves or bends. The gyrations of a garden hose, if left to itself with a good head of water on it, will serve to illustrate what will happen if this precaution is neglected. The regulators are placed in manholes built in the street. They are either of brick or concrete, and each regulator has an inlet and outlet and a bye-pass valve. The use of two regulators in parallel is advocated, and they are in use in some locations. We have found in this climate that one extra regulator on hand of each size is a good plan. As the regulators are inspected at stated intervals, trouble can be anticipated and the regulator removed to the repairing-shop, where proper adjustment can be made while the extra one takes its place. During the change the bye-pass is operated.

The matter of drips has caused considerable trouble, but principally in systems where the entire installation is high pressure, or where the feeders are small. A device composed of fittings has been used in some cases, which makes the gas turn at a sharp angle, to precipitate its moisture. This works very well on high-pressure distributing-mains of small installations, but it is not practicable in a feeder. At first, it was deemed sufficient to tap the main, and merely blow out the condensation with its own pressure. Experience, however, has shown that this does not always give satisfaction, and it was found necessary to go back to the low-pressure gas practice, and design a drip-pot with an opening the full size of the pipe, which can be inserted in the line by means of the flange-coupling adapting-pieces already referred to. If you stop to consider that there is a time of minimum consumption during the 24 hours, when the gas in the mains is almost at rest (the velocity being practically nothing), and that this occurs when the temperature is lowest, and hence best for the precipitation of moisture, it is apparent that, if these drip-pots are placed at the low points, they will catch the condensation. Then it is an easy matter to blow it out with pressure.

In the course of the discussion upon the paper, Mr. Cope asked the author if he had any data as to the proportion of water that would go into a pressure main per million cubic feet of gas. Mr. Grover replied that he had not. Mr. Jones (of San Francisco) said he thought it would depend upon the humidity of the gas, though it might also depend upon the compression. It was possible that the water would be prevented from entering the main system. Dealing generally with the paper, he said the handwriting on the wall at Belshazzar's feast was applied to all cast-iron main systems in California by the earthquake of the 18th of April; and the only thing that saved the mains was the lead joints. Much had been written about the comparative excellence of cement and lead joints for cast-iron pipes, and the balance had always been in favour of the cement joint on account of its great strength; but while a cement joint was much stronger than an ordinary cast-iron gas-pipe, where the pipe was drawn apart by the frost, as in the Eastern States, the cement joint held and the pipe was broken at the back of the bell rather than at the joint. The argument was only in favour of lead joints in earthquake districts. He had nearly 65 miles of high-pressure steel gas-mains; and the earthquake did not disturb a foot of them. There was not a broken joint; and the pliability of the pipes was what saved them. High-pressure systems had a great advantage over all low-pressure ones in the matter of testing for leaks; and the provision of initial storage of gas on the former systems, under greater pressure than that carried on the mains, was of importance. If they provided compressors, sending gas

into the high-pressure mains at a moderate pressure (say, 20 lbs. to 40 lbs.), large enough to carry the peak hour, and then provided in parallel smaller high-pressure compressors, to the limit of the mechanical capacity of first-stage compression—about 80 lbs.—and let the smaller compressors pump during the day into the pressure tanks, which should amount to as much as 20 per cent. of the peak hour, then they were provided with a storage of gas under high pressure. This should be automatically fed into the low-pressure mains by regulators, so that it did not depend upon any man's memory to keep the system supplied with gas.

Mr. Lowe could give the members some slight idea as to the twisting of high-pressure gas-mains by his own experience at Palo Alto. At the time of the earthquake, probably no locality suffered more severely, as every two-storey brick building was shaken. The line of the fault was about 6 miles from San Francisco, while it was only 3 miles from Palo Alto, where there were more than 12 miles of mains and upwards of 500 service-pipes. They obtained their gas from Redwood City, about 5 miles distant. The plant consisted of four compression-tanks. The Redwood City plant was put out of commission for a few days. The first act of the manager at Palo Alto was to close the services, so that when the gas came on there would be no danger of sending it into the houses. They were anxious to test the mains, and this afforded an admirable opportunity. When the gas was finally turned on from Redwood, they did not have a single leak. The mains were absolutely tight, notwithstanding tanks, mains, services, and the entire works stood the very severe disturbance of the earth at that point. Mr. Britton remarked that the fact that the tanks were not disturbed was attributable to their being buried beneath the ground. Mr. Newbert stated that the high-pressure mains between Redwood City and Palo Alto, as well as between it and San Mateo, tested perfectly after they turned the gas on, and did not show one leak. The compression-tanks and the regulator connections were not disturbed in the least. Mr. Britton said he had a line between Santa Rosa and Petaluma; it was the longest they had. They all knew the effect of the disturbance at Santa Rosa; but there was not a leak or break in any of the lines.

Mr. Jones said he had not had a single leak reported to him on these lines. The one from Santa Rosa to Petaluma, 17 miles in length, was in operation, and the Oakland lines were tested and showed no leakage. The various high-pressure couplings were being subjected to improvement from time to time, and one of the latest changes was the substitution of a steel barrel for covering the joint of the two pipes. Formerly it was cast iron; but with the use of the steel barrel the joint was as flexible as the pipe. The flanges were so closely drawn that it was utterly impossible for any gas to get near the rubber gasket (excepting a feather edge), to cause it to rot and produce a leak. Mr. Grover said he believed the actual reason was that a very small surface of the rubber was exposed to the gas. One who had had a good deal of experience in regard to the life of couplings claimed to have taken them apart after they had been in the ground from 25 to 30 years, and found that the rubber was in good condition. He said he should like to refer to one thing in connection with the earthquake and its effect on their pipe in Oakland that went across what was known as the Twelfth Street dam. It was a concrete culvert through which the water from Lake Merritt ran to the estuary. Across the dam they had two mains—one an 8-inch cast iron, the other a 6-inch high-pressure main—laid about 15 feet apart, and both built into the solid masonry. The earthquake broke the Contra Costa Water Company's pipe there, and washed out some of the roadway, and broke the 8-inch gas-pipe on both sides of the masonry—the ground sinking from 18 inches to 2 feet. While they were working on the 8-inch pipe, they looked up their high-pressure main, and found there was only one place where the road had not fallen, and there it was held up by the high-pressure main.

In answer to an inquiry by the Acting-President as to whether or not anyone had had experience of the life of steel pipe, Mr. Jones said it depended almost entirely upon the coating and on the manner of handling the pipe. It was perhaps not generally understood that it was not the thickness of the pipe, but the coating, that was the more important, and the handling of it subsequent to the coating, while it was being laid. Two-inch plain-end tubing should be thoroughly scraped free from all rust, and then it should have a good coating of red lead and oil. They found this was the best protection. After it had been coated, no tools should be used on the pipe; and it should be handled carefully. The length of life of the pipe should be in decades, not in years. He saw no reason why a 2-inch pipe should not last 30 years. They found that by using the best quality of red lead and boiled linseed oil, having it thoroughly mixed, and permitting the paint to dry without the use of any driers, they had the best possible coating. It prevented oxidation where it covered the steel; but the red lead itself was subject to changes, which had been very troublesome. He believed in using red lead next to the steel pipe, and protecting it with a coating of metallic oxide, such as was used for gasholder tanks.

Mr. Cline was requested to relate some of his experiences in Los Angeles; and, in response to the invitation, he said the Gas and Electric Company had been operating a high-pressure system for something like three years. The existing system consisted of 30 miles of standard wrought-iron pipe—10 miles of 12-inch and probably 20 miles of 2-inch. Part of the system was used for a feed-line to the low-pressure system, and was tapped at about six different points, with district governors set for an outlet pressure of 8 inches. They had some 5000 consumers on the high-pressure lines, and their governors were set for a pressure of 3 inches. The pressure plant consisted of three compressors, two of the capacity of about 175,000 cubic feet per hour each, and the other of 75,000 feet capacity. They were run by electric motors. They had no compression tanks, and had never had a single moment's interruption or an accident of any kind. The plant had been most satisfactory from its inception.

Mr. Weber said he had a pipe-line, nearly 17 miles in length, between Santa Rosa and Petaluma. It was a 2-inch steel pipe, with smooth ends and connected with couplings. It was tested immediately after the earthquake, including the compression and condenser tanks, and up to the regulators, which were almost in the centre of the town. It was found perfectly tight. The compressor was kept on over half-a-day, and did not drop in the least. For services to individual consumers they used a ½-inch pipe, which was painted with two coats of red lead; and any tool marks that might be made were thoroughly painted over and tested before the pipe was covered. In this way the pipe was protected as far as anyone could protect it by paint. They ran at 2 lbs. pressure on their mains to the town, and used a governor for individual consumers—in some cases having as many as six meters on one service; but the ½-inch pipe was always of ample capacity to supply every customer.

Mr. Lloyd said he understood from Mr. Jones that he did not use or recommend screwed pipe for a pipe-line; and he noticed that in all his installations he employed plain-end instead of screw-end couplings. Mr. Jones said it was now well known that all threads in ordinary wrought-iron pipe couplings were straight threads. The threads on the end of an ordinary piece of wrought-iron pipe were cut with a taper die; but those on the inside of the couplings supplied with the pipe were ordinary straight threads. As the taper thread was screwed into the coupling, the joint depended on two or three threads, and therefore in nearly every instance the pipe screwed together with ordinary couplings would leak. If it did not at first, it would later. The high-pressure couplings, as now made, were comparatively cheap, and were easily applied. The rubber, even if it was not durable in the presence of gas, would last many years if it was not disturbed. He had found, however, that it was impossible to take the rubber gaskets from the pipe and use them over again. The rubber adhered to the pipe, making a permanent joint; and he believed it would last many years.

Electrical Bulletins.

The Industrial Supplement of the "Electrician" recently had an article in which unkind things were said about the compiling of local Electrical Bulletins. An extract reads: Several municipal stations issue, more or less spasmodically, a booklet or "bulletin," in which an appeal is made to the consumer, both present and potential, to take advantage of the local electric service. Not a few of these publications contain photographs and biographical notes of members of the electric light committee or the town council, according to the degrees of notoriety of these particular gentlemen. The same booklet will also enter into details of the central-station equipment, giving technical information upon the boilers, engines, switch-gear, &c., all of which is supposed to be of absorbing interest. Presumably the idea is to impress the local tradesmen or residents with the thoroughly adequate manner in which the supply system is arranged to meet their every convenience. It may also be thought that the prospective customer will go into raptures over this "triumph of engineering" and forthwith enrol himself on the consumers' list. We wish to disillusion the station engineer who pins his faith to matters of this class, and to emphasize the folly of circulating literature in which these details predominate. As for the biographical matter, the engineer should certainly draw the line at that. His lamp connections will not increase because Jones, the pork butcher, and, incidentally, the Chairman of the Electric Light Committee, spends his week-ends in Paris, and uses inverted gas-burners in his dining-room.

The Geological Features of the Lincoln Boring.—At a recent meeting of the Geological Society, Professor Hull discoursed on the geological conditions which contributed to the success of the artesian boring for water at Lincoln, to which reference has been made on several occasions in the "JOURNAL." The boring has its source of supply in strata which rise to the west, but to the east dip towards the North Sea. The water-yielding stratum is reddish, soft, porous sand-rock, reached at a depth of 1561 feet, and penetrated to a depth of 474 feet. The sand-rock belongs to the new red sandstone. The hydraulic pressure at the bottom of the boring is that due to about 2035 feet; and the friction of the water in percolating the rock accounts for the fact that the water can be pumped down during the day, but rises again in the night. The formations penetrated are: Alluvium and lower lias, 641 feet; Rhætic beds, 52 feet; red marl and lower Keuper sandstone, 868 feet; bunter sandstone, 454 feet. The quantity of water drawn from the new red sandstone amounts to not less than 20 million gallons; and the total available quantity of water percolating into the sandstone amounts to about 300 millions.

CONCRETE PIPE CULVERTS.

During the past summer, an investigation into the subject of concrete pipe culverts was made by Mr. O. P. Chamberlain; and an account of the results was given in a recent issue of "Engineering Record."

A number of pipes were built with an inside diameter of 4 feet and with 6-inch walls, resembling in shape large drain-tile pipes, having neither spigot nor faucet. The concrete was a mixture of portland cement, limestone screenings, and crushed limestone, in the proportions of 1 to $3\frac{1}{2}$ and $3\frac{1}{2}$, which passed a $\frac{3}{4}$-inch and refused a $\frac{1}{2}$-inch ring. Each pipe was 4 feet long. The inside and outside forms were of the ordinary wooden tank type. The inner form had one wedge-shaped loose stave, which was withdrawn after the concrete had set for 24 hours, allowing the form to collapse. The outer form was in two semi-cylindrical sections, having heavy semi-circular iron hoops on the outside, with loops in their ends. When the forms were in position, the loops of one section came directly above those of the other; and iron pins slipped through the loops fastened the two sections of the form together. After the concrete had set, the pins were withdrawn and the forms removed. The pipes were built near a derrick, with which they were loaded on flat cars for transportation. At the culvert site they were unloaded and put in place by an ordinary gang of men; no other appliances than skids being used to remove them from the cars. As each 4-feet section of 48-inch pipe weighed about 2 tons, it was not deemed advisable to build sections longer than 4 feet to be manipulated by hand; but where a derrick car is available, there is no reason why they should not be built in 6-feet or 8-feet sections. All work except building the forms was done by labourers; and the cost of the pipes under these conditions was $2·50 per lineal foot, or $9·62 per cubic yard. This high cost was due, in part, to the small scale on which the work was carried on; and it was considered possible to manufacture the pipes in quantity for $7 per cubic yard, or $1·83 per lineal foot, including the cost of the forms.

These 4-feet pipes have been placed in low embankments where their tops are only 18 inches below the lower sides of the cross ties. They were laid in shallow ditches which had been made to conform to the shape of the pipe as well as could be with picks and shovels. The back and top filling of the earth embankment was thoroughly tamped. It is stated that so far they have given satisfactory service under heavy freight traffic; but they have not been in use long enough to warrant pronouncing them an unqualified success. The cost of transporting and placing concrete pipes is high, owing to their excessive weight; but their very low first cost apparently more than offsets this, according to Mr. Chamberlain, even when it is necessary to haul them for a considerable distance.

A type of concrete pipe which has been extensively adopted on the Chicago, Burlington, and Quincy Railway is heavily reinforced, both transversely and longitudinally, with corrugated steel bars; the rings being so placed that the reinforcement is in the outer surface at the sides of the culvert, and in the inner surface at the top and bottom. The shape of these pipes is very nearly that of ordinary cast-iron pipes with socket and spigot. They are made with inside diameters of 2, 3, and 4 feet.

WATER PURIFYING FOR INDUSTRIAL PURPOSES.

At a Meeting of the Coventry Engineering Society on Friday, Mr. C. E. Douglas (of the firm of Messrs. Mather and Platt), lectured on the "Purification of Water for Industrial Purposes." He said that the purification of water was important to manufacturers from two points of view—its purification for their special purposes, and also in connection with the disposal of trade effluents. Many river authorities and local bodies required an increasing degree of purity in the effluent before it was allowed to enter a stream or to be poured on land for irrigation. He anticipated the imposition, particularly in congested districts, of still more stringent regulations; and in many instances these would be necessary from considerations of health. The lecturer proceeded to explain the three methods employed for purifying water—mechanical, chemical, and bacteriological—and indicated that one of them might be used in conjunction with another. He said there was no doubt that by the proper purification of water great saving could be effected in the upkeep of boilers; and he expressed regret there were so many manufacturers who did not realize the importance of this, and continued to allow all sorts of objectionable water to pass through the boilers. He exhibited a $\frac{3}{4}$-inch tube showing a deposit of lime which reduced the efficient bore to less than $\frac{1}{4}$ inch—the deposit being as hard as the metal of which the tube was made. Besides the interference with the transference of heat, there was danger from local over-heating, and it was evident that when this scale formed, it must imperil the life of the boiler.

Dealing with the question of water softening, Mr. Douglas gave some interesting examples of the manner in which the amount of hardness varied; sixteen samples, taken at random, showing from 14 to 70 degrees. He said there were instances in which 100 degrees were found. There were many forms of softeners, and he expressed a preference for the intermittent system. As to the cost, this varied with the amount of hardness. While water which had only 15 degrees would cost $\frac{1}{2}$d. per 1000 gallons for chemicals only, really bad water might require an outlay of 6d. This was a very expensive treatment, of course; but some people might be so situated that if they did not soften the water available it would come dearer to purchase it. As a matter of fact, in many cases, the cost of erecting and maintaining softeners was negligible, because of the saving in the cost of removing scale, the depreciation of the boilers, and the attendant risk of failure. Before embarking upon any process of softening, he urged that samples of the water should be submitted for expert chemical examination, and advice then taken. In the portion of the subject relating to the separation of oil from water, the lecturer argued that this should be done before the steam was condensed, and mechanical means used, as when once condensed the water and oil formed an emulsion which was most difficult to separate. On the question of filtration, he held very strongly that, especially in congested districts, the mechanical filter was really much ahead of the sand bed. As to results, he claimed that in six cases out of sixteen water had actually been purified by filtration alone to the extent of 99 per cent.; and he submitted illustrations of working plant which gave $99\frac{1}{2}$ per cent. In treating trade effluents, he showed that settling-tanks were not always satisfactory, and that in addition there was either the chemical or the bacteriological method to adopt, according to the nature of the effluent. In cases where this was putrescent or contained organic matter, he commended the latter method.

At the conclusion of the lecture, the Chairman (Mr. J. E. Swindlehurst, the City Engineer for Coventry) spoke very highly of it; and after some discussion, a hearty vote of thanks was passed to Mr. Douglas.

The American Gas Institute and the "Question-Box."

Our readers are aware that the "Question-Box" has for some few years been a feature of meetings of Gas Associations on the other side of the Atlantic, and that the Ohio Association paid particular attention to this department of their work. Under the able editorship of Mr. Henry L. Doherty, several interesting volumes of questions and answers have been published, and have received due notice in our columns. The last was presented at the meeting of the Association in March, and was fully dealt with shortly afterwards. In view of the then approaching formation of the American Gas Institute, into which the Association was to be merged, Mr. Doherty resigned, and the question of continuing his work remained in abeyance till the general meeting of the Institute in October. We learn from the official report of the proceedings on that occasion, that Mr. Doherty formally moved that an editor should be chosen to carry on the "Question-Box" at the expense of the Institute. He said he could not personally undertake the work if it was continued, which he certainly thought it should be; but in the course of the discussion on the subject he expressed his willingness, if the Institute would not incur the necessary expense, to contribute $1000 to keep up the book, if anyone would undertake its publication. But his idea was that the Institute should bear the cost, under the control of the governing Board. The motion was carried.

The World's Consumption of Nitrate of Soda.—According to the half-yearly report on nitrate of soda by Messrs. W. Montgomery and Co., Limited, the year just closed was one of great prosperity to producers, as evidenced by the dividends declared by some of the nitrate companies. Figures given at the end of the report show that the world's consumption of this material for the past three years was 1,447,000 tons, 1,547,000 tons, and 1,641,000 tons; while the shipments for the same periods were 1,476,000 tons, 1,623,000 tons, and 1,719,000 tons. The present visible supply is 749,000 tons, compared with 674,000 tons at the close of 1905.

British Standard Screw-Threads.—The latest addition to the long list of publications issued by the Engineering Standards Committee has recently appeared, and consists of three tables of British standard screw-threads. Table I. gives full particulars of Whitworth threads, for sizes from $\frac{1}{4}$ inch up to 6 inches in diameter, advancing by 16ths up to 1 inch, and by 8ths from 1 inch to 6 inches; the sizes being given in fractions and decimals. Table II. is exactly like Table I., with the exception that it is for British standard fine screw-threads, instead of Whitworth. Table III. is for British standard pipe-threads, and gives particulars of tubes from $\frac{1}{8}$ inch up to 18 inches in diameter; the diameters advancing by 8ths up to 1 inch, by $\frac{1}{4}$ inch up to 4 inches, by $\frac{1}{2}$ inch up to 6 inches, and by 1 inch up to 18 inches in diameter. This table is divided into eight columns, the figures in which give the nominal bore of the tube, the approximate diameter of the black tube, the gauge diameter at the top of the thread, the depth of thread, the core diameter, the number of threads per inch, the nominal length of the thread on the pipe end, and the minimum length of the thread in the coupler. The tables are issued in two forms—one pamphlet, supplied gratis on receipt of a 1d. stamp; and mounted on card and varnished for use in drawing offices, &c., the price being 6d. net, post free 10d. Both forms are procurable from the Secretary of the Engineering Standards Committee, No. 28, Victoria Street, S.W.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Engineering Association was held on Saturday, at the City of Birmingham Technical School. Indisposition prevented the President (Mr. G. W. G. Tatam) being at the meeting; and the Vice-Presidents (Messrs. W. E. Caton and S. T. Smith) were also unable to be present. Under these circumstances, Mr. F. J. Bywater was voted to the chair.

Mr. R. J. Rogers (Birmingham) read a paper—from which the following are extracts—entitled "Notes on Distribution and Gas Supply." In connection with his remarks on incandescent lighting, the author exhibited different systems in operation; and at the conclusion of the meeting, the members were, by invitation of Mr. G. Hampton Barber, the Secretary of the Birmingham Gas Department, taken by Mr. Rogers to the Council House to inspect the compressing plant used in connection with the high-pressure gas lighting installation in Victoria Square, which was referred to in the "Journal" for July 17 last, p. 202.

NOTES ON DISTRIBUTION AND GAS SUPPLY.

During the past few years, a much greater amount of attention has been given to the question of distribution than had hitherto been the case. By a combination of circumstances—such as the introduction of improved forms of incandescent lighting, and the inverted burner, the extended use of our gas for internal combustion motors, the enormous improvements that have been made in the design and adaptability of gas fires and stoves, and a number of other improvements that have been effected in all branches of the fittings used for the supply of gas—the energies of the manager or superintendent in charge of the outdoor department are taxed to a far greater extent than was the case a few years ago.

High-Pressure Gas Transmission.

The suburbs of most of our large cities are now increasing by leaps and bounds; and the problem which will eventually be brought before gas suppliers will be as to the best means of giving these outlying districts an adequate supply of gas. Within the area of supply of gas undertakings, we occasionally find that, 4 or 5 miles from the city or the gas-works, a new town, garden city, or model village suddenly springs up; and in looking back over the system of gas supply to these areas, we invariably discover that, as the district has increased, so the gas undertaking has installed correspondingly additional mains in the neighbourhood. This state of affairs is allowed to go on for a year or two; but eventually it is recognized that a greater volume of gas is required, and that a new feeder main, sub-station, or other means becomes necessary for giving an increased supply of gas at a pressure suitable for modern requirements.

It is under these circumstances that the utility of high-pressure gas transmission is in my opinion better realized. By the installation of a pressure-increasing plant on the gas-works, and the laying of suitable mains to the outlying district, an adequate supply of gas may be delivered; and the pressure may be regulated to the required degree by the manipulation of the district governors. I feel convinced that we—especially those of us connected with large and flourishing undertakings—shall in the near future be brought into close contact with the question of high-pressure gas distribution.

Besides carrying out the primary object of supplying gas to the outer district, there are many other uses to which the high-pressure gas may be admirably put. For instance, high-pressure street lighting in the thoroughfares through which the mains would run could then be carried out on a large scale, and the continued success of gas as a high-power street illuminant be fully assured. In fact, high-pressure supplies for stations, factories, or any large buildings could be conveniently given. A typical instance of a building being supplied direct with high-pressure gas from the main is that of Broad Street Station, London. Here the gas is obtained from the high-pressure main of the Gaslight and Coke Company, which runs near by; the gas pressure being suitably reduced before passing into the special meter.

High-Pressure Gas-Lighting Systems.

The introduction of high-pressure gas lighting has undoubtedly added materially to the position of gas as a street illuminant; and from all parts of the country we hear of its continued success, and the substitution of this form of lighting for electricity. There are several methods of obtaining this increased illumination by means of additional pressure; and I will briefly refer to some of the systems now in use.

High-Pressure Air System.—This method of obtaining increased flame temperature in burners used for illumination purposes, by means of compressing the air, instead of the gas, is one which has only within the past few years been placed on the market; and up to the present no very rapid progress has been made in its adoption over the usual methods of supplying high-pressure lights by means of compressed gas. Several installations, however, are in use in various parts of the country, and are generally giving very good lighting results.

The advantages which are claimed for the high-pressure air system of lighting may be summed up as follows: (1) Smaller outlay for plant than in the case of gas compressing machinery (2) That the system may be readily applied to premises, as no new gas supply-pipes are necessary, and the supply of gas to ordinary burners or low-pressure consuming apparatus is not interfered with. (3) Owing to working at a pressure of 2 lbs. to the square inch, the air supply-pipes may be of small diameter. (4) The danger consequent on the leakage of gas from pipes when subjected to high pressures is obviated.

I had some experience recently in the installation of a high-pressure air system; and perhaps a few notes on the working of the installation may prove of interest. In this particular case, the air-pressure is obtained by means of a small Sturtevant blower, driven from shafting in the engine-house. The air is compressed to about 2 lbs. to the square inch, and after leaving the blower passes into a small tank, which acts as a reservoir for the compressed air, and on which there is fitted a relief-valve, which is also utilized as a governor. From this tank the supply of air is distributed along the pipes to the burners. The burners used are fitted with a special adjustable air and gas nipple; and once the air supply is regulated no further attention is generally required, as the speed of the blower is very evenly maintained in this installation.

In the first place, some slight trouble was experienced, owing to the presence of an enormous quantity of very fine dust in the vicinity of the blower. These minute particles of dust were carried through the distributory pipes, and deposited in the small air-orifice of the burner, stopping the air pressure, and reducing the illuminating power of the burner. This difficulty, however, was quickly overcome by the fixing of a flannel filter on the inlet to the blower, and by fitting special "dust-traps" at the base of each burner in the lamp. The construction of these dust-traps was such that, should any particle of dust be carried forward in the pipes, it would be deposited in the base of the trap before reaching the small air-hole of the burner.

As regards the action of the blower in compressing the air, this has now worked satisfactorily without a hitch for twelve months. The maintenance cost for mantles compares very favourably with the systems using compressed gas, in which also the working pressure is considerably less; and generally speaking the installation of air lighting is successful. I am of opinion that this system of using high-pressure air for lighting will, in the future, be more frequently adopted—especially when improvements have been effected in the making of suitable lamps to withstand wind, rain, and dust—a direction in which there is certainly ample scope for advance.

High-Pressure Gas System.—There are numerous methods of supplying increased pressure of gas to high-power burners. The pressure at which the gas is delivered to the burners from these different plants varies from between 6 inches water-gauge pressure in some plants to 50 inches in others. Why should there be this great difference? Is there any advantage gained in working at this higher pressure? Personally, I fail to see any gain in using any higher pressure than 20 inches. The life of a mantle is considerably reduced when used on burners supplied at such high pressures as 50 inches; and the danger and loss of gas by leakage are further increased.

I am unable to place before you any photometrical results of tests of burners used under these varying pressures; but from an observation of two systems—viz., one in which the gas is compressed to 16 inches, the other to 40 inches—and a comparison of the nominal candle power (as stated by the makers) per foot of gas used, I am of opinion that there is no advantage in candle power gained by using such pressures as 40 or 50 inches.

Self-Intensifying Lamps.—Various improvements have been made in the intensifying apparatus used in these lamps during the past two years, with the result that the lamps and burners used under this system are more reliable and give better lighting results than was the case a few years ago. Self-intensifying lamps are very suitable for isolated positions, where a light of higher illuminating power is required than is obtained from the ordinary incandescent burner; and they are no doubt very economical, as according to the test made by Mr. J. Foreman, of Westminster, a Scott-Snell self-intensifying lamp gave 32 candles per cubic foot of gas consumed, and only cost 0·9375d. for 1000 candles for one hour. This self-intensified lamp was the most economical of any under test, which included various types of high-pressure, self-intensified, ordinary incandescent burners, and inverted incandescent burners. I am, however, of opinion that, for very high candle powers and for competition against electric flame arcs, the high-pressure lighting as obtained from compressing plant is more satisfactory and efficient than self-intensified lamps.

The Inverted Burner.

As an instance of the saving effected by the adoption of the inverted burner over the incandescent electric lamp, I would mention this case: A certain business premises in one of the main thoroughfares of Birmingham, in which the majority of the lighting is for shop windows, which were previously lit by electric light, have adopted inverted burners for lighting, and the following is the result:—

Quarter ending March, 1905.		Quarter ending March, 1906.	
Gas	£4 8 4 ..	Inverted gas lighting	£11 8 4
Electricity . .	22 4 11 ..		
June, 1905.		June, 1906.	
Gas	£3 17 0 ..	Inverted gas lighting	£5 19 3
Electricity . .	8 3 1 ..		

Thus showing a saving for the half year of £21 5s. 9d., besides which three times the illuminating effect was obtained.

The use of inverted burners for church lighting is steadily increasing; and there is no doubt that they are very suitable, though there has recently been some adverse criticism of the use of them for this purpose. The inverted burner may be arranged to answer the same purpose as the upright incandescent burner, as regards the lowering of the lights during a portion of the service by arranging the system of supply-pipes. Though there is a greater tendency on the part of the inverted burner to light-back or carbonize on the reduction of the gas supply than in the case of the upright burner, there are, nevertheless, many churches and public institutions where the burners are used without bye-passes, and turned down during a portion of the service, without any injurious effect on the burners as regards lighting-back and carbonization. I would not, however, advise this system of lowering where inverted burners are used, and am of opinion that the better plan is to connect series of burners, according to their position in the church, with some automatic lighting arrangement. In this case, of course, bye-passes would be used; and the burners connected with the automatic arrangement would be completely extinguished during the service when required.

Street Lighting by Inverted Burners.

The system of street lighting by the inverted burner is one which I think will in the future be brought prominently forward, as the general construction of the burner adapts itself very well to the requirements necessary for ordinary street illumination. Through the courtesy of Mr. A. E. Currall, the Surveyor of the Solihull Rural District Council, I am enabled to bring before you a few notes respecting the actual results of a system of street lighting by inverted burners. As far as I can ascertain, Solihull was the first district in which these burners were adopted generally for street lighting.

The installation has now been in use for two years, and may be said to have safely passed the experimental stage. The burner used is the "Etna," of Messrs. Arculus and Co. The average consumption of this burner is 3 cubic feet per hour, at a pressure of 20-10ths, for which the makers claim an illuminating power of 65 candles. The burners are fitted into the ordinary 14-inch street-lanterns under a 10-inch opal reflecting shade; and a small glass bulb is fitted on the burner for the protection of the mantle. The supply-pipe is carried from the bottom, and up inside the corner of the lantern; and the burner is suspended from a stretching-piece fixed across the top of the lamp. The bye-pass to the burner is carried up vertically from the stand-pipe.

Fig. 1 shows the method of fixing the burner in the existing lanterns. It will be seen that the conversion of the lighting from flat-flame to inverted incandescent burners can be readily effected, and at comparatively small cost. A lamp may be converted from the flat-flame to the inverted incandescent system, and fitted with burner, reflecting shade, and mantle-protector complete, for less than 10s.; so that, taking into consideration the saving in gas consumption over the flat-flame system, the capital outlay on the conversion of the lamp is quickly repaid, besides which three times the illuminating effect in the streets is obtained.

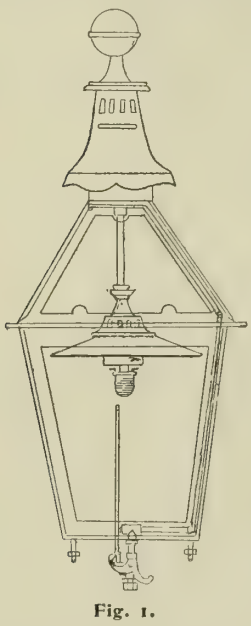


Fig. 1.

In this particular installation, the average life of a mantle per burner during the winter months is about forty days; so that the cost of maintenance is not a very great item. No trouble is experienced here in the lighting of the lamps; and no more time is taken up than with the old arrangement. The system of bye-passes answers admirably, as the tip of the bye-pass does not come into contact with the flame of the burner (as is the case in most inverted bye-passes), and consequently carbonization on the tip does not take place. Only during exceptionally windy nights are any of the bye-passes blown out; and then these only average about one or two per night. In the event of a bye-pass being blown out, it is easy for the lamplighter to light the burner in the usual manner with his torch, as, owing to the shape of the mantle-protector, the mantle is readily accessible.

This system of lighting at Solihull is giving every satisfaction, both to the authorities and the public at large, and no doubt the method will be further extended. One noticeable feature is the opal shade, which is nearly flat, with only the slightest suggestion of an angle; the reflective power being very good. It is quite possible to read an ordinary newspaper at a distance of 15 yards from either side of the lamp.

Automatic Lighting and Extinguishing Apparatus.

There is still scope for the ingenious inventor to place on the market some reliable self-lighter which does not entail the burning of a pilot-light, and which may be controlled from a distance. The platinum self-lighters in their various forms are not sufficiently reliable at present to be very largely adopted. They appear to answer for a short time fairly satisfactorily; but one cannot say they are as yet anything like a practical success. An arrangement has recently been patented for the self-lighting of inverted burners by means of a small pellet of platinum or other suitable metal being fixed in the bottom of the globe, directly under the mantle. In this position, it is not subjected to the injurious effects of the products of combustion, as are most platinum self-lighters with the ordinary upright burners.

The automatic lighting and extinguishing of street-lamps by means of increasing the pressures in the street-mains has been found to answer satisfactorily; and perhaps one of the most successful of these systems is that of Dr. Rostin, which is in use by the Tottenham and Edmonton Gas Company. I was recently informed by Mr. A. E. Broadberry, of Tottenham, that the apparatus was working very successfully in his district. The first installation of 80 lamps was made about two years ago; and at the present time there are fitted or on order upwards of 1200 lamps. Mr. Broadberry states that he has no doubt the system will eventually be extended to the whole of the 4000 lamps supplied by the Company.

Gas Fires and Heating Apparatus.

The question of supplying gas-fires free to slot consumers under like conditions to those applied to slot cooking-stoves, is a subject which is being repeatedly brought forward, especially by those who are interested in the great problem of smoke abatement. It is, however, a very debatable question as to whether the increased consumption of gas by fires supplied under these conditions would justify the capital outlay on the purchase of the fires, and the fixing and maintenance charges on same. The average consumption of these gas-fires would not amount to anything like the quantity of gas used in slot cookers. With the majority of prepayment consumers, the only rooms where they would require gas-fires to be fixed would be either in the front sitting-room or bedrooms; and the average use of the fires per week in these rooms would amount approximately to only 9 hours. This would represent a consumption of something like 200 cubic feet of gas per week. Would this justify the additional outlay? If slot consumers could be induced to have gas-fires installed in their living-rooms, the question would be a very different one; but I am afraid the general public are not yet sufficiently alive to the importance of universally adopting gaseous firing.

Suction Producer Gas Plants.

I will endeavour to bring before you in as accurate a manner as possible a few comparisons of the actual working costs of suction producer plants as compared with town gas. I have arrived at the figures of comparison on the following assumptions, which I think you will agree are very fair.

Town Gas.—1s. 6d. per 1000 cubic feet net. I have taken this figure as being the price charged for power gas by most undertakings that have to any great extent to compete against the suction gas plant.

Quantity of Town Gas Used per B.H.P. Hour.—20 cubic feet of gas, with a calorific value of 600 B.Th.U. per cubic foot. This figure is perhaps slightly above the average quantity of gas used per B.H.P. hour by the engine, especially in a modern engine, when the figure would be nearer 17 cubic feet; but, by working on the assumption of 20 cubic feet, we shall include some of the older types of gas-engines which are not quite so economical in consumption.

Anthracite.—24s. per ton delivered on premises. This, I think, is the average current price charged for anthracite—at any rate, within the area covered by this Association, According to a letter issued by the Western Valleys Anthracite Company in October last, the price of anthracite is not likely to diminish owing to the sudden demand for the class and size of coal suitable for use in suction producer plants. The sizes of the nuts used in the majority of the present-day plants varies from ½ to 1¼ inches, and of this size the quantity obtained from each colliery amounts to only about 14 per cent. of the whole output; so that I do not anticipate the cost of the fuel being reduced to any considerable extent for some time to come.

Quantity of Fuel Used per B.H.P. Hour.—1·25 lbs. This quantity I have taken for my calculations after a careful perusal of the results of actual fuel consumption tests made on various plants, and think it may be taken as being an average rate of consumption by a plant that receives the usual amount of attention from the man in charge.

Quantity of Water Used per B.H.P. Hour.—2 gallons, at 1s. 6d. per 1000 gallons; this being the usual consumption of water by ordinary suction producer gas plants.

Number of Working Hours of the Engine per Annum.—2800 hours.

Wages.—This item varies with the size of the plant; the larger plant necessarily requiring more attention than the smaller one.

It will be obvious, from an inspection of the figures I place before you, that the greater the load is upon the engine, the greater is the advantage in running costs of the producer plant over town gas. But the question of the cash value of the advantages of the town gas over the producer gas, and which I will shortly mention, requires to be taken into account by the individual user of a plant. In my opinion, this slight saving of 10s. per week, on running costs only, is not sufficient to induce the power user to instal a suction plant in lieu of town gas.

Comparative Costs of Town and Producer Gas.

Engine of 14 B.H.P. working throughout the year at an average of 9 H.P.

Annual Running Costs.

	£ s. d.	Producer gas.	£ s. d.
Town gas	37 16 0	Anthracite	16 17 0
		Water	3 15 0
		Depreciation on outlay (£80) at 10 per cent.	8 0 0
		Repairs	2 0 0
		Wages, at 6s. per week.	15 12 0
	£37 16 0		£46 4 0

Showing an actual saving on running costs of £8 8s. in favour of town gas.

Engine of 25 B.H.P. with an average working load of 20 H.P.

	£ s. d.	Producer gas.	£ s. d.
Town gas	84 0 0	Anthracite	37 10 0
		Water	8 8 0
		Depreciation on cost of plant (£120) at 10 per cent.	12 0 0
		Repairs	3 0 0
		Wages at 6s. per week .	15 12 0
	£84 0 0		£76 10 0

Here you will notice that there is a saving in running costs in favour of the producer plant of £7 10s. per annum, or about 3s. per week; but when we take into consideration the items of expense and the various advantages of town gas, which we have not reckoned in our calculations, but which I will enumerate a little later on, I think you will agree with me that this amount is quite inadequate to show any real economy over town gas.

We will now take, for example, a 50 B.H.P. engine working with an average load of 40 H.P.

	£ s. d.	Producer gas.	£ s. d.
Town gas	168 0 0	Anthracite	75 0 0
		Water	16 16 0
		Depreciation on cost of plant (£140) at 10 per cent.	14 0 0
		Repairs	5 0 0
		Wages at 12s. per week .	31 4 0
	£168 0 0		£142 0 0

Showing a balance in favour of the producer gas plant of £26 per annum, or 10s. per week.

I will now proceed to enumerate a few of the points not included in the foregoing running costs of the two systems, and which are invariably left out of the question by power users when a comparison of the two systems of power production is being considered. (1) The cost of the conversion of the existing engine to enable it to work satisfactorily on producer gas. This alteration is essential to the satisfactory working of the engine. In the majority of cases, the adoption of a producer gas-plant entails the purchasing of an entirely new engine; and this is an important item to watch when making comparisons. (2) The saving of floor space, and space occupied in the storage of fuel and refuse. (3) The cost of the periodical removal of ashes. (4) The regular and practically constant supply and quality of town gas, as against the varying quality of producer gas obtained from time to time. (5) The adaptability of town gas at all times without any troublesome preparation of producing apparatus. (6) The absence of smell, and the escapes of poisonous carbon monoxide gases. The large percentage of carbonic oxide present in the plants has recently claimed the attention of the Inspectors of Factories; and the Home Office issued a short time ago a memorandum drawing the attention of users of the plants to the danger of poisoning. Another point to be taken into consideration is the difference in the effective horse power developed by engines being run on producer gas, as compared with the same engine being supplied by town gas. Owing to the difference in the calorific value of the two gases, I should estimate that the power of an engine would be reduced by approximately 30 per cent. when producer gas was used to the engine.

In the tables I have placed before you, no allowance has been made for the interest on capital expended on the cost of a new engine, or in the conversion of the engine; nor has the cost of the overhauling and cleaning out the generator and scrubber of the plant been taken into account. This is an operation which requires to be frequently done in a well-kept plant; and the work necessarily has to be carried out when the engine is stopped.

From the figures I have here given, I think that the position of town gas as regards supplies for power purposes for engines up to 50 B.H.P. is assured when sold at the rate of 1s. 6d. per 1000 cubic feet.

Stand-By Charges for Meters.

The question of the charge for hire of stand-by meters—that is, meters which are only used to supply town gas when the producer gas, for some reason or another, is not available for the engine—is one which has necessarily arisen with the introduction of suction producer plants; and to my mind, it certainly does not seem just to the general body of gas consumers, that a customer who only occasionally requires a supply of town gas to his engine should, owing to the failure of his producer plant, be supplied at the same price as the regular everyday customer.

The Mirfield Gas Company, in their Bill which was brought before Parliament in the early part of 1906, inserted a clause "that the Company should not be bound to supply gas to suction gas-plant users without 24 hours' notice from the consumer, and then only if the supply could be given without interfering with the demand for public or private lighting." When before the Unopposed Bills Committee of the House of Lords, this clause was passed by Lord Onslow; and as this was the first occasion on which such a clause had been granted, it was regarded as a most important precedent. But when it came before the Unopposed Bills Committee of the House of Commons, it was struck out of the measure. In my opinion, a hire system should be instituted which would cover all capital and maintenance charges of the services and meters provided for these temporary requirements, so that the gas undertakings should not suffer any loss. The charge should be according to the size of the meter; and, providing a stated quantity of gas be consumed per quarter, the hire charge should be waived. The minimum quantity of gas to be used to exempt hire being charged, should be based on the average consumption of the meter when used under working conditions. My experience in this matter tends to show that the majority of users of producer plants prefer to have an auxiliary supply of town gas connected to their engine, where it is readily available. By this means, the engines can be readily started on town gas, and work commenced in the factories; and when gas of sufficient calorific value has been generated in the producer plant, the town gas can be easily turned off, and the producer gas supplied to the engine, without stoppage of the engine, or delay to workpeople.

There are several very reliable and convenient methods now in use for turning off from one gas to another by the operation of one valve or plug-cock, without the fear of mixing the two gases. This question of the prevention of the intermixture of the two gases is one to which, I think, we should pay particular attention. Take, for instance, a pressure producer plant in which the gas is delivered to the engine at 4 inches water-gauge pressure, and town gas is also connected, and supplied at (say) 2 inches. If the gas supply-pipes were only fitted with single cocks, and if both cocks were accidentally or carelessly left open at the same time, the result would be fairly obvious. The producer gas, being of the higher pressure, would force the town gas through the supply-pipe, back to the meter, and pass through the meter into the town gas distributing mains; the consequence being that, owing to the lower calorific value and absence of illuminating power of the producer gas coming into contact with the town gas in the mains, "pockets" of low-grade gases would be formed which, it is needless to say, would soon make themselves evident when the coal-gas apparatus of the consumers was reached.

I have known incidents such as the above taking place; an epidemic of complaints of poor supply and bad gas being the natural sequence. Such cases show how essential it is that some reliable method of preventing the intermixture of the gases should be insisted upon by the gas supply undertakings; and, further, we should not rely on the engine and plant makers supplying a two-way cock to answer the purpose, without satisfying ourselves that it would be a practical impossibility for an intermixture to occur. I mention this as I have recently been brought into contact with several cases where two-way cocks have been fitted by the engine makers with the object of preventing an intermixture of the gases, and where, owing to the plug of the cock being too small, or the gas-ways in the plug made too large, it was quite possible for an intermixture to occur.

The plug of the cock should be of ample dimensions to allow of the travel from one port to another without the possibility of an intermixture taking place during the process of changing over from one gas to another. Not that any large quantity of gas would be able to pass through the open port to the other gas supply during this operation; but should the plug of the cock be left in a position half-way between the two ports for any length of time, an intermixture would take place. This will perhaps be better understood by a reference to figs. 2, 3, and 4 (p. 98). Care should be taken that the plug is properly "knighted," as fig. 3. The sketches are not drawn to scale, but serve to illustrate the point in question. This, of course, is only one type of the many cocks now used for the purpose of separating two gases.

I have only as yet explained what the result of the mixture of town gas with the gas from a pressure producer plant would be; and I will now explain what would be the result in the case of a suction gas plant. The result of the intermixture in this case would be slightly different from that of the pressure producer plant. Instead of the producer gas forcing its way through the town gas supplies into the mains, the tendency would be (when the engine had ceased work, and the generation of the gas had thereby stopped) for the town gas to pass through the suction gas supply pipe, and collect in the scrubber of the plant. In some plants which are not fitted with a water-seal between the generator and the scrubber, it would most likely reach the generator, and in the event of a supply of pure air being admitted, s ich as at the base of the fuel in the generator, where the hot fuel above raises the temperature of the mixture to the degree necessary for combustion, there would in all probability be formed an explosive mixture, and the risk of an explosion would be thereby incurred.

The National Board of Fire Underwriters in America have issued regulations in which they state that "where illuminating or other pressure gas is used as an alternate supply, the connections must be so arranged as to make the mixing of the two gases or the use of both gases at the same time impossible." This is a

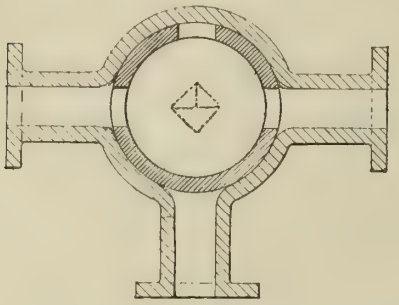


Fig. 2.

With a plug of this size, and when quarter knighted (as shown in fig. 3), it is impossible for an intermixture to take place, as the three ports can never be open at the same time.

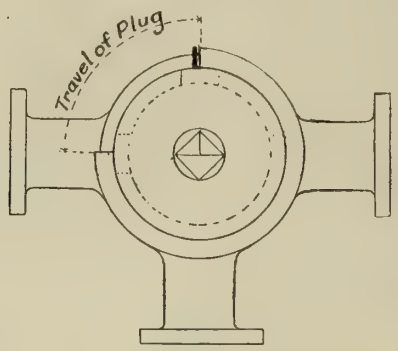


Fig. 3.

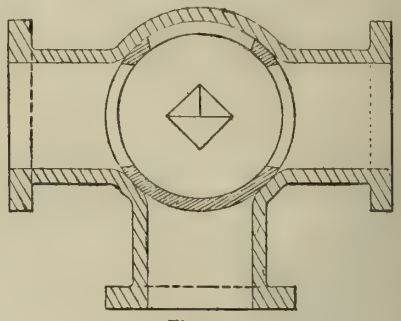


Fig. 4.

With this sized plug, it is possible to get a mixture of the gases, as the three ports may be open at the same time.

regulation which, in my opinion, should be adopted by all gas undertakings where town gas is used as an alternate supply to engines run on producer gas.

The author concluded his paper by urging the advisability of arranging an examination on the "Distribution of Gas," on similar lines to that now held on "Gas Manufacture;" and he suggested that the Senior Associations should be asked to give the Junior Associations their support in placing this matter before the City and Guilds of London Institute. He also urged the desirability of gas companies and corporations giving facilities (as several already do) for the education and practical training as gas-fitters of the apprentices or fitters' boys.

Discussion.

Mr. W. Lycett (Birmingham) remarked that he had himself had something to do with the high-pressure air system; and he believed there was a future for it. He thought a worse place than where this system was in use very successfully for trying any other kind of lighting than the ordinary flat flame, could not have been found. In an exposed position, where there were clouds of steam rising and quantities of fine dust, the air system answered very well—its intense heat clearing the mantle in a very short time. With a little improvement, it might be made a very successful light indeed. Certainly, high-pressure systems had come to stay, as with them they obtained a better light for a given quantity of gas. He did not quite agree with the author about putting down another main from the works to supply an outlying district. It would be very costly; and there might be other difficulties. He did not see why the existing gas-mains could not be utilized, and made high-pressure ones all over the district. It need not be a very high pressure; and it could be easily controlled by means of governors and screw-down cocks, and perhaps a relief-valve and anti-fluctuator. This would be a very good thing for shops, &c., and street lighting. For dwelling-houses, they did not require high pressure. If they could get a constant pressure of (say) 20-10ths—which would be quite possible—this would be an ideal position to arrive at for inverted burner lighting. Gas suppliers, also, would not for years have to spend much money on new mains to meet the growth in demand; and the money so saved could be well spent in renewing old services and providing means for controlling the gas to the ordinary pressure at the point where it entered houses. With reference to church lighting with inverted burners, this was easily done provided the pipes were of a good size throughout. It was possible to turn an inverted burner down to about half; but there must be a good sized service, otherwise the difference in pressure would mean that a certain number of them would light-back. He knew of a church where these lights were turned up and down in different parts of the building just the same as when flat-flame burners were in operation. As to the street-lamps in operation at Solihull, did they not get the mantles black with the bye-passes being placed under them? and was there much shadow round the base of the columns? The price of anthracite had gone up considerably. The rate now, delivered in Birmingham, was about 29s. per ton, which made a difference in the working costs of suction plants. Then he hardly thought that Mr. Rogers put down sufficient for wages. About 12s. per week for an engine of 50 B.H.P. was not enough. It ought to be 18s. or 20s., as a good deal of attention was needed by these plants.

Mr. P. C. Balcon (Swan Village) said that, in connection with the street-lamps at Solihull, he hardly saw the necessity for putting in inverted burners. Upright burners, he should have thought, would have answered just as well, and would have been cheaper. The paper was a most interesting and instructive one.

Mr. G. Ball (Saltley) said Mr. Rogers had covered a great deal of ground; but his paper was on the right lines, for it afforded good scope for discussion. There was no doubt high-pressure distribution would come in time, though perhaps not so much in the case of large towns already laid out with mains, on account of the cost that would be entailed in altering the system. About 20-10ths was a very nice pressure for working at; and most people would feel very well satisfied with it. But when they considered that at the bottom of a hill they would have 20-10ths, and at the top perhaps 28-10ths, they would recognize the difficulty of controlling the pressure generally at a regular 20-10ths. If the whole of the mains were to be turned into high-pressure ones, it would be necessary to have nothing but dry meters. Of course, with wet meters at a high level, it was requisite that care should be taken not to blow the water out of them. In considering the high-pressure system as a system, there was no doubt that what gas engineers at present thought about more than anything was that the governor which had to control the pressure might get out of action, and blow the water out of the wet meters. At Nuneaton, a system of high pressure had been installed for the purpose of getting gas into a district some five or six miles away. There was a small high-pressure main. This, of course, was all right, because they were running out a main to increase the supply to a district; and there was no doubt that this was a matter which was well worth the consideration of the members. If they had a place five miles away, and they wanted to get gas there, no doubt the system would be to run a feeder out without interfering with the supply off the other mains. He knew Mr. Bywater was much interested in high-pressure gas distribution; and he thought he favoured it considerably. New towns springing up would certainly go in for it. As to gas-fires, those of the present day were almost perfect. There was only one thing necessary, and that was to get an absolutely silent fire. He had never yet seen one that was silent. This was a great trouble to some consumers. If it was necessary to burn a fire at night, and on being turned down it made a noise, it was very disagreeable. There was a good opportunity here for someone with an inventive mind. He had himself tried unsuccessfully to design a silent burner. If, as Mr. Rogers said, they could only get working people to use gas-fires in their living-rooms, instead of coal, it would be a very good thing for gas managers; but he was afraid this would not come about in the present generation. The training of gas-fitters was certainly a step in the right direction. Years ago young gas-fitters had no opportunity of learning, as they had to-day in some towns. It was the duty of employers, when possible, to see that young gas-fitters attended classes regularly, and, by paying their fees, qualify them to do their work properly. The school in existence in Birmingham had borne very good fruit; and youths when they left it at the age of 21 would be able to hold their own with any gas-fitters throughout the country. They must have a practical training; and this could only be secured with the aid of those who employed them.

Mr. L. J. Hoyles (Midland Railway, Derby) remarked that there was no doubt the inverted burner was most satisfactory for many purposes; but he was rather surprised to hear it was successful for street-lamps. He thought lighting by inverted burners in streets was very patchy. In the case of some lamps of which he had had experience, they were all right when first lit; but there were soon signs of carbonizing and corroding. For good economical street lighting, or for the lighting of railway sidings, the upright "C" or Kern burner was hard to beat.

Mr. J. H. Willoughby (Leamington) said there was one point in the paper on the subject of high-pressure gas lighting which he did not quite follow. Mr. Rogers reckoned that the highest pressure that should be used was about 20 inches. If with a certain system they found they got the best results at 50 inches, he failed to see what they would gain by reducing it to 20 inches. At Leamington, at the present time, they lit up their retort-house on the Millennium system. There were six burners—three on each side—with nipples passing 14 cubic feet of gas per hour, and giving 600 candles light. They had applied the same system at a four-way crossing at the railway station. There were two burners there. At first they used nipples which passed 37 cubic feet per hour, and gave a light of 1300 candles; but it was found that this was rather too much for the working of the mantles. The nipples had therefore been reduced so as to pass 24 feet per hour, and gave a light of 1000 candles. They obtained the best results by using a 4-inch mercury gauge pressure—equal to 54 inches water gauge. On reducing the pressure, they found that the light fell away very much; and he could not see what advantage they would secure by only working the system at 20 inches, when they got such good results at 54 inches. Of course, there was the question of mantles; but the object of a high-pressure system was to obtain a good light, and he did not see why they should reduce the light to save the mantles. It was quite possible to make the mantles last a reasonable amount of time. In the retort-house and also where the lamp was fixed at the four-cross roads, with varying wind pressure

and great traffic, were hardly fair places to judge by; but at the Imperial Stove Factory at Leamington there were from forty to fifty Millennium burners in use for indoor lighting, and there they made the mantles last a month at the same pressure—54 inches. He could not say they were always able to make their own last so long; but they had had very satisfactory results. The conveying of gas under high pressure was a very good plan, and bound to come to the front; but he could hardly agree that it was advisable to do this in the existing mains, because it was necessary to think of the leakage account.

Mr. C. M'Pherson (Nechells), referring to the idea of running high-pressure mains to suburban districts, said it was all very well to talk about having governors here and there, and putting in anti-fluctuators, but this was only adding trouble to the whole system of distribution. They all knew these governors were apt to fail when they were wanted to work, though they acted very well at times. In large towns, there were mains ranging from (say) 48 inches down to quite small diameters; and to govern these various sized mains would be very difficult. This was a large question in connection with high-pressure distribution. In his opinion, the fewer governors they had, the better. Another matter which had not been brought forward in relation to distribution, was the standardizing of fittings; and the standardizing of inverted burner mantles was also a subject deserving of attention. The existing state of things would, he was afraid, lead to enormous trouble and expense. To his mind, it was time the wet meter was entirely dispensed with. It must give trouble; and with higher pressures, the dry meter was bound to come. Mr. Rogers wisely laid stress on the necessity of preventing any mixture of suction gas with the gas in the town mains. The idea mentioned by Mr. Rogers would be considerably improved by putting two cocks in and arranging them in such a way that one would be shut off and one be on at the same time. He certainly agreed that the width of the cock and plug shown were quite in order; but if there were two cocks—one from the producer plant and the other on the town gas main—it would prevent any gas from the suction plant going into the town mains, and also any of the town gas getting into the generator of the producer plant. He believed the insurance people were very strict about this, and gas suppliers should be as strict. Mr. Ball had spoken of varying pressures in a hilly district; but he (Mr. M'Pherson) thought this was wrong. He did not agree that in low-lying districts there was one pressure, and in higher parts another. It was really their mistaken way of measurement.

The Chairman, in proposing a hearty vote of thanks to Mr. Rogers, remarked that the paper covered a very wide range of subjects; and he thought any one of the matters almost was worthy of a paper by itself. The previous speaker had raised a question which was rather interesting, and which was open to very grave discussion—namely, whether there was a higher pressure at the top of a hill than at the bottom. He believed, as Mr. M'Pherson had said, it was all a matter of the method of measurement, and that there was not any more pressure at the top than at the bottom. The air was, of course, rarer at the top. There was great argument on the subject among scientific people; but still if there was a meter at the top of the hill, there would soon be a blow if they did not make an allowance. What he thought Mr. Rogers had in mind when referring to high-pressure distribution, was an outlying district which suddenly increased its consumption—such as took place particularly in America. There mushroom towns grew up, and were in a hurry for a gas supply; so a feeder was put down, with a governor. That there were not so many of these installations in England was not due so much to a dislike of them, as to the fact that the necessity for them did not exist. They did not see mushroom cities spring up in England; but sometimes a town increased rapidly, and there was a call for a larger supply of gas, with which a high-pressure system was the best method of dealing. He did not agree with the author as to the most suitable pressure to use with high-pressure lighting systems. He thought much better efficiency was obtained from 40 inches than from 20 inches. In an instance he knew of, they had recently got from 38 to 40 candles per cubic foot of gas at 40 inches pressure. With 10 inches they obtained from 30 to 33 candles. As to gas-fires, it would be a great improvement if so much of the heat did not escape up the chimney, but was made to pass through a radiator. Some of the figures given in connection with suction plants he did not agree with. For instance, 20 cubic feet of gas, of a calorific value of 600 B.Th.U., per B.H.P. hour was very high, as there were engines to be obtained now requiring only 15 or 16 feet. In presenting their own side of the question, they ought not to throw anything away. Water at 1s. 6d. per 1000 gallons was surely an outside price; and the quantity used—2 gallons per B.H.P. hour—was very high. He should have thought the average figure was more nearly 1 gallon. The outlay for a producer plant was, he believed, more nearly £10 per B.H.P. than the figure the author stated. This was a very important point. In one case, Mr. Rogers said, "Depreciation on outlay (£80) at 10 per cent., £8." If, however, the outlay was increased to £160, the margin between suction gas and town gas was at once made much wider. As regarded the difference in efficiency between engines running on suction gas and those working with town gas, the author put this at 30 per cent. He (Mr. Bywater) did not know what producer gas he had in mind; but suction gas usually had a calorific value of under 200 B.Th.U.; and if town gas was taken at 600 B.Th.U. the efficiency was reduced, by using suction gas, to the extent of 60 or 70 per cent., instead of 30 per cent. With reference to stand-by meters, it was unfair to saddle the ordinary consumers with the cost of these. The ordinary gas consumer had to pay a lot of money for the fact that the hours of darkness were longer in winter than in the summer. Gas could be sold at a much lower rate if the suppliers had not to keep practically 50 per cent. of their plant idle during part of the year—that was to say, if the hours of darkness were the same all the year round. Therefore the ordinary gas consumer had to pay for the stand-by plant at the gas-works; and it was fair that a man who used a suction producer should have to pay for having a stand-by supply of town gas. In his opinion, the suction producer was very much overrated. He knew personally of several installations having been abandoned, because they failed to give satisfaction. An examination in "Gas Distribution" would be a good thing; but at the same time, a distributing engineer could not have too much knowledge. He should be in a position to discuss intelligently with everyone all matters relating to gas. He (the Chairman) should certainly support an appeal to the City and Guilds of London Institute to either enlarge the syllabus and divide the examination into two parts, or else start an examination on an altogether separate basis for "Gas Distribution."

The Hon. Secretary (Mr. James Hewett) seconded the vote of thanks, remarking that there was a lot of useful information in the paper. The portion that appealed to him most was that relating to high-pressure distribution. He did not know to what extent the author suggested high pressure—whether in pounds or inches—but he agreed with what had been said in the discussion as to the difficulties in their way before they could possibly adopt it in towns where the systems were already more or less completely arranged. A short time ago, he went into the matter; and the first question was that of cost. The capital cost was in favour of high pressure; but taking into account the working cost—*i.e.*, the power for compressing the gas—it was found that the difference in the yearly cost was practically *nil*, taking the interest and depreciation into consideration. The chief objection to the adoption of high pressure was the governing; and if Mr. Rogers knew of any arrangement that could govern safely from (say) 5 lbs. pressure to 2 inches, without any leakage for ten hours from the valves, he should be very pleased to hear of it.

Mr. Rogers, replying to the discussion, remarked that he could not agree with Mr. Lycett that existing mains could be utilized for high-pressure gas transmission. In a case such as he had suggested—a district five miles away requiring an increased gas supply—if they had a trunk main to thoroughly overhaul and had to insert governors in the different mains leading from it, he thought the cost would amount to nearly as much as that of laying a small high-pressure main. His idea was not so much to take off supplies on the way as to feed the district five miles away entirely. This could be done by compressing the gas into a holder in the district. At Nuneaton, the method adopted for reducing the pressure was a small governor fixed on the service-pipe to each consumer's meter; and this governor worked very successfully. Mr. Hewett asked if he knew of any efficient method of governing from a high-pressure system; and he might refer him to that in use at Nuneaton. He believed it was an American governor; and he did not know of any English-made one that answered the purpose. He did not see, however, why they should not be made here. As to the sizes of pipes for church lighting, when there was a small pipe and plenty of pressure, they got a good, efficient light from an inverted burner. At present anthracite was about 29s. per ton; and before twelve months had gone by, he believed the price would be still higher. With reference to his figure of 12s. per week for wages, of course the amount varied considerably in different works. In some places they might have a man doing odd jobs at a small wage; and it did not require very much skill to look after these suction plants, if there was an engineer on the works to supervise. If a man earning labourer's money—say, 25s. or 26s. a week—devoted half his time to the plant, the figure would be about what he had put in the paper. The cost of cleaning the scrubber and generator varied in each case; and, of course, it had always to be taken into consideration. With reference to Mr. Balcon's remark about the advisability of using inverted burners for streets, he believed that at Solihull before the system was adopted they had flat-flame burners; and as they had to adopt a new method, it was as well to choose this one. The mantle maintenance was as good as with any upright burner; and if they had selected the upright system, the lamps would not have been converted at much less cost. In a half year, the cost would be repaid in the saving of gas over the flat-flame burners; and he thought the light was better than with the upright system. As to the light at the base of the column, naturally there would be a shadow, owing to the construction of the lamp. For really efficient lighting by inverted burners, a special lamp was required. Something had been said about the cost of maintenance of a high-pressure main; but he (Mr. Rogers) certainly thought that it would be cheaper to put down such a main than to build new gas-works out in the district, which might otherwise be necessary. The difficulty of meters blowing could be, and had been, got over with governors. He quite agreed that it was in the case of new towns that high-pressure distribution would be more likely to be taken up than where the mains were already in position. The noise of gas-fires had been a great trouble in the past; and it could not be said that it had been got over entirely even now though manufacturers were getting nearer to a solution. With

regard to the statement that inverted burners were quite unsuitable for street lighting, he had seen cases where the mantle had been on six weeks or two months without showing any sign of carbonizing, and not much reduction in illuminating power. Of course, the upright "C" burner was very suitable for some positions; they must not entirely discard it for the inverted burner. The pressure used with the Millennium system was a very high one, and no doubt it gave a very good result; but for general high-pressure lighting, he must say he thought that, as they had secured such excellent efficiency from systems which only used 20 inches, he did not think there was anything in going to 50 inches to secure so slight an increase in candle power. With gas compressed to about 18 inches pressure, tests had given from 30·7 to 33·3 candles per cubic foot; while on a system working at about 40 inches pressure, a light of 32 candles was obtained. The results Mr. Willoughby had given with the Millennium lamps were very good indeed; and he thought that the great reduction in illuminating power experienced when the pressure was moderated, was to a great extent due to the construction of the burner in connection with the air and gas supply. He could not agree that the wet meter should be altogether abandoned—it was a very good and reliable instrument; but the dry meter should be used more than was the case. Mr. M'Pherson mentioned that there were other methods of preventing the intermixture of gases; but this was admitted in the paper. In the arrangement he (Mr. Rogers) set forth, however, it was impossible to get a mixture; and he did not know that anything more simple could be adopted. Mr. M'Pherson's suggestion would involve rather more complication than the two-way cock. He would like to know whether the candle powers—38 to 40—per cubic foot mentioned by the Chairman were obtained with a photometer.

The CHAIRMAN: Yes.

Mr. ROGERS (continuing) remarked that to utilize the waste heat from gas-fires would necessitate so much alteration that it would not be worth the expense in the case of an ordinary fire; but it might be advisable with big apparatus. In his comparisons of cost, the quantity of town gas used—20 cubic feet per B.H.P. hour—was rather high; but he thought it better to err on the side of the producer people than on his own. As to the 1s. 6d. per 1000 gallons put down for water being too much, this would be the price charged in Birmingham to consumers of 51,000 gallons a year. In other towns, the charge for the same quantity would be as follows: Sheffield, 1s. 0½d.; Manchester, 1s. 6½d.; Leeds, 6d. The price mentioned in the paper for plants was about right for the majority of makers. A 14 H.P suction gas plant might be obtained for £80. With reference to the difference in efficiency of engines working on producer and town gas, he could not say what the calorific value of the producer gas was in the particular case he had in mind. But in an actual test made, the engine developed 65 H.P. on producer gas from the suction plant; while with town gas of about 600 B.Th.U., it ran steadily at 96 H.P., and occasionally got up to 116 H.P He thought, therefore, that there was at least 30 per cent. difference in efficiency.

The members then proceeded, as already mentioned, to inspect the gas compressing plant at the Council House.

Mr. John Richardson Wigham, whose death was noticed in the "JOURNAL" for the 20th of November, left £17,745.

Mr. Richard B. Evered, of the firm of Messrs. Evered and Co., Limited, of Drury Lane, who died on the 7th of November left estate valued at £58,640, of which £15,877 is net personalty.

The late Mr. Thomas James Brinsmead, one of the Directors of the Welsbach Incandescent Gaslight Company, whose death was announced in the "JOURNAL" for the 13th of November last, left estate valued at £14,933.

At the annual banquet of the Institute of Chemistry of France a few days ago, it was announced that the French Government had drawn up a decree giving academic recognition to the profession of chemical engineer.

The Home Secretary has appointed Mr. Ernest Aves to be a Commissioner to inquire into and report upon—(1) the system of Wages Boards in Australia, (2) the compulsory arbitration systems in force in Australia and New Zealand, and (3) the Shop Hours Acts of the two countries.

Four large gas-engines, of from 1500 to 2000 horse power, are being erected at the La Paix works of the Société des Hauts-Fourneaux Dorrains, at Aumetz, Lorraine. They are designed to work with waste gases of blast-furnaces, and will be utilized partially as blowing-engines and partly to drive dynamos.

Intermittent flowing wells are so rare, that one at Albany (Ga.) deserves mention. According to Mr. Charles Tift, formerly City Engineer of that place, an 8-inch well was sunk into the cavernous limestone underlying the city, to serve as a drain for a pool of surface water covering about half-an-acre, and averaging 18 inches in depth. At a distance of 90 feet below the surface, a cavity 6 or 8 feet through was encountered. The drill was withdrawn, and the water drained into the hole, which it did not fill. About six minutes later, the water began to bubble; and almost immediately the entire column was thrown perhaps 30 feet into the air. This draining and ejection was repeated with diminishing force for more than an hour; and the same phenomenon occurs whenever a heavy rainfall fills the pond.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

Mr. Dugald Clerk on the Cost of Electricity for Power.

SIR,—I am much obliged for yours of the 18th ult., enclosing copy of a letter from the Secretary and Manager of a Gas Company in the North of England, pointing out an error in some figures on the above subject in my lecture delivered at Sheffield last November. I should have answered ere now, but unfortunately have been laid up. The numbers given by your correspondent are correct. With electricity at 1d. per unit and a motor efficiency of 90 per cent., the cost per horse power is, as he states, 0·828d. instead of 0·67d. as given by me as the result of an arithmetical slip. I appear to have multiplied 0·746 by 0·9 instead of dividing by 0·9. I shall be greatly obliged if you will publish this letter pointing out the mistake.*

18, *Southampton Buildings, W.C., Jan.* 3, 1907. DUGALD CLERK.

* The mistake referred to occurred in the sixth line of the fourth paragraph on p. 464 of the "JOURNAL" for Nov. 13 last.—ED. J.G.L.

Flicker Photometers.

SIR,—Flicker photometry is obtaining a good "advertisement" in the pages of the "JOURNAL," and in the general scientific papers, by reason of Mr. Haydn Harrison's paper, on "Photometry," and also the publication of specifications of so-called "new" forms of "Flicker" photometers. I trust therefore that you will find room for the following brief comments, which really deal with the genesis of flicker photometry.

Mr. Haydn Harrison says that, in 1896, Whitman invented the "Flicker" photometer, and that there is little to choose between the instrument so invented and the Simmance-Abady instrument. If this latter statement is correct, I should be glad to know how it can be reconciled with the facts that in 1903, the Zurich Commission met to investigate colour photometry in connection with the testing of incandescent mantles, at which Commission Professor Vivian B. Lewes made the statement that now at last, by the introduction of the Simmance-Abady "Flicker" photometer, the colour question had been solved. Further, in 1903, no "Flicker" photometers other than the Simmance-Abady, were in use in Europe. If therefore, as Mr. Harrison says, the Whitman is the same, or as good, as the Simmance-Abady "Flicker" photometer, it is obvious that for seven years no one found out the fact, and Mr. Harrison has only discovered it now. I further find that Professor Stine in 1902 stated, in his photometrical work, that the Whitman photometer was incapable of being reversed, which, I think, clearly proves the distinct difference in principle between it and the Simmance-Abady instrument, which can, of course, be reversed or used at any angle.

Those members of the Gas Institute who called at our Page Street works during the meeting in 1902, may remember being shown one of the Whitman spinning-card photometers, and also one of the ordinary greased bunsen discs. At that time, Mr. Abady and myself were very sanguine of making it into a practical instrument; but the fact that it is impossible to "reverse" any of these cardboard or paper-disc arrangements, renders them entirely useless in accurate photometry. It was with this in our minds that we stated in our specification of February, 1903, that flicker phenomena had been entirely misunderstood, and that attempts to utilize it in photometry had failed. We, therefore, laid down the actual rules which we found to be necessary to produce an accurate "Flicker" photometer; and by the help of these rules there is no difficulty for anyone designing and making up a proper "Flicker" instrument—providing, of course, that the actual line of invention shown in our specification is not copied.

Concluding, I may say that the inventor of the "Flicker" photometer was Sir Isaac Newton, when he made his "Newtonian Disc."

Westminster Palace Gardens, S.W. Jan. 4, 1907. JNO. F. SIMMANCE.

Hathersage and its Gas-Works.

SIR,—In the "JOURNAL" of yesterday's date there is a paragraph, headed "The New Gas-Works at Hathersage," in which the Contractors for the works, Messrs. Blakeley, are made to say that the mistake alluded to in your issue of Dec. 18 was of a very primitive nature.

It may appear to Messrs. Blakeley to be of a primitive nature; but I think not so to other people. The mistake was in the fixing and riveting-up of sheets of Nos. 12, 13, and 14 B.W.G., in parts of the gasholder for which No. 10 B.W.G. sheets were specified.

Had it not been for this mistake, gas would no doubt have been made and supplied before the 1st of December. The delay has been in the time taken by the Contractors to replace the thin sheets by others of proper gauge. The alteration of buildings referred to, really did not cause a fortnight's delay.

Matlock, Jan. 2, 1907. T. BROWN.

The Disposal of Ammoniacal Liquor in Small Works.

Writing in reply to the letter on the above subject by "S/A" which appeared in the "JOURNAL" for the 18th ult., Messrs. Biggs, Wall, and Co., state that their figures are based upon actual practice, allow sufficient working margin, and include a fair carriage on the sulphate. They say good sulphate will readily sell at 2½ per cent. under quoted prices; and they know of several gas-works where the sulphate is all disposed of locally at £13 per ton. Good grey sulphate—not blue or inferior salt—made at small works will always fetch top prices. With regard to the cost of acid, this greatly depends upon the freight charges. They mention that a small plant such as they suggested will cost about £240, erected complete and put to work.

REGISTER OF PATENTS.

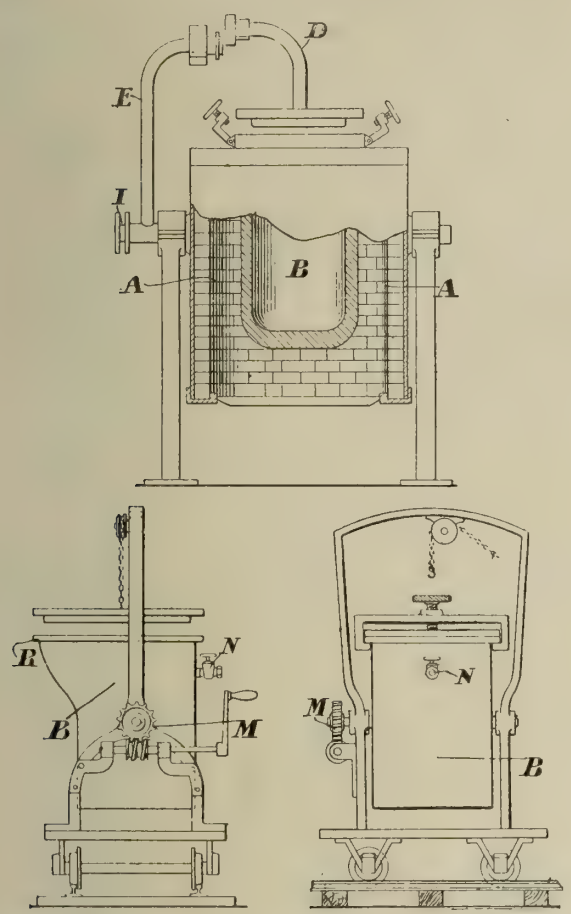
Removing Sulphur and Other Impurities from Coke.

SIMPSON, W. S., of Battersea Park Road, S.E.

No. 25,574; Dec. 8, 1905.

This invention relates to a process for treating coke so as to remove sulphur and other impurities, by creating a vacuum in the vessel containing the coke in a highly heated state.

The illustrations show a part sectional elevation of a stationary apparatus constructed for the purpose of the invention; also a side elevation and an end view of a movable apparatus.



Simpson's Appliances for Extracting Sulphur, &c., from Coke.

In treating the coke before removal from the retort, after the coal-gas extraction is completed, all exits are hermetically closed and a suction pump is applied to the retort; or, in the other case, the coke from the retort, in a highly-heated state, is placed in a vessel of a stationary or movable character, and hermetically sealed. The exhaust pump, connected either to the retort or the vessel or coke-oven, is then operated and sucks out or exhausts all the sulphur, gases, and impurities from the coke, and keeps up such exhaustion during the whole or part of the treatment. When sufficient exhaustion has taken place, the coke is cooled down in the ordinary way; the sulphur, gases, and other impurities being treated in the usual manner to recover bye-products.

In the stationary apparatus shown, A is a circular brick-lined furnace, in the centre of which is suspended the coke receptacle B, the upper end of which can be closed by the cover through which the pipe D passes, which, when the cover is in position, can be coupled to the pipe E. The whole furnace is supported by trunnions on uprights, so that it may be turned completely over if necessary. The packed gland I allows for the movement of the furnace without disturbing the pipe, which communicates with an exhaust pump to produce a high vacuum in B. The coke placed in B is kept hot for the proper length of time by an external fire in A, which may be either coke or gas fired. At the same time it is subject to a vacuum, by which means all sulphur is removed.

In the movable form of this plant, the receiver B has a cover made air-tight by an asbestos ring and a screw clamp. A worm gear M provides means for turning up the receiver B to shoot out its contents. N is an ordinary cock provided with a union so that it may easily be coupled up by a flexible tube to an air-pump, so that a high vacuum may be produced in B. Rails are provided for the apparatus in the retort-house at a suitable distance from the mouths of the retorts. When a retort is to be discharged, the lip R is brought just under the mouth of the retort, and the contents are discharged into B. The cover is then closed, and the trolley run away to some suitable place. The hot coke is left under vacuum for a proper length of time, when all volatile matter will be found to have been removed.

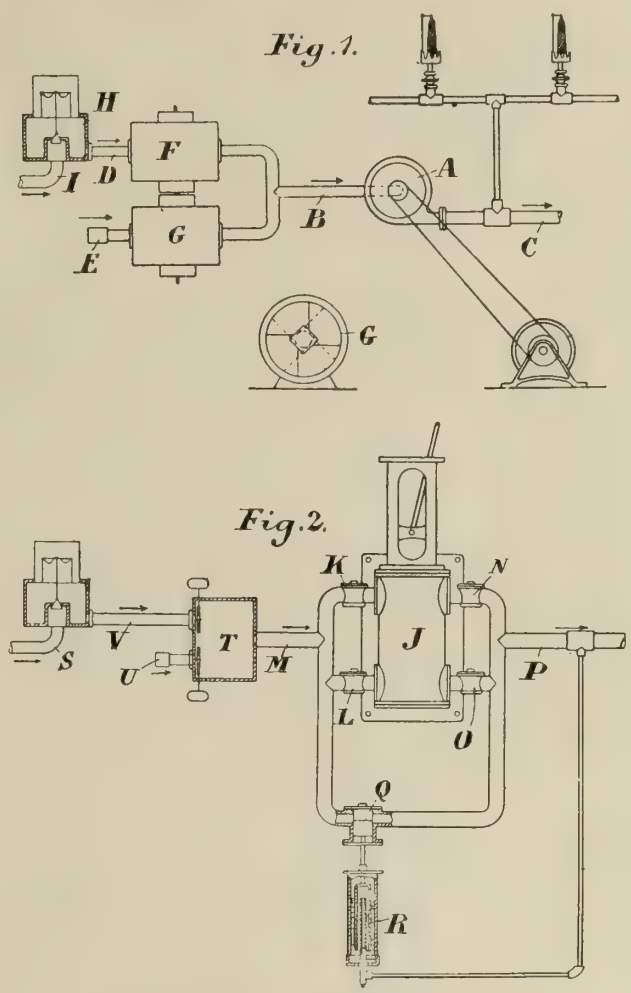
Mixing Gas and Air for Illuminating Purposes.

LAKE, H. H.; a communication from SELAS G.m.b.H., of Berlin.

No. 25,596; Dec. 8, 1905.

This invention relates to means to be employed for the production of a gas and air mixture for illuminating purposes by the use of a suction and forcing apparatus which produces and sucks the mixture at low pressure and sends it into the service at a higher pressure.

The point of departure of the invention is said to be the knowledge that by the employment of a suction and forcing apparatus supplying the gas and air mixture at an increased pressure, irregularities arise in the mixing proportions of the gas and air, when in the case of varying consumption, for example, the mixture withdrawn from the suction pipe of the suction and forcing apparatus alters. Now, in accordance with the present invention, unequal mixing proportions of the gas and air are prevented, owing to the fact that the gas and air are brought to corresponding pressures in front of the suction place. It is only possible to maintain a uniform ratio of the quantities of gas and air with varying demands upon the suction and forcing apparatus (more especially in the case of its uninterrupted operation) when the difference of pressure between the supply pipe for the gas and the suction pipe on the one hand, and the supply pipe for the air and the suction pipe on the other hand, are maintained equal in their proportional ratio. If the pressure in the gas supply pipe is called x, the pressure in the air supply pipe y, and the pressure in the suction pipe z, in accordance with the invention the two pressures x and y are equal in magnitude. If therefore, owing to the varying consumption of the gas and air mixture, the pressure z alters, still $\frac{x}{z} = \frac{y}{z}$ always. Accordingly, it cannot happen when, for example, owing to a small consumption of the mixture, only a small quantity is supplied by the suction and forcing apparatus that an increase of pressure thereby entailed should cause an alteration of the quantitative proportions of gas and air, because the gas and air are at the same pressure.



Modifications of the Selas Light System.

The invention comprises an arrangement and combination of devices for bringing the gas and air to the same pressure. Fig. 1 shows diagrammatically an installation with rotary supply apparatus. Fig. 2 illustrates an installation with a piston supply apparatus in which the gas is conducted to the suction pipe without pressure.

In fig. 1, the suction and forcing apparatus—(for example, a continuously rotating device A driven off a motor by means of a belt)—sucks the gas and air mixture from the pipe B, and then supplies it to the service main C. The gas flows through the pipe D and the air through the socket E. Now, in order to maintain the two pressure differences (referred to in the introduction) between the suction pipe B and the gas supply pipe D on the one hand, and the suction pipe B and the air supply pipe E on the other hand, equal in their proportional constant ratio, and to prevent irregularities in the mixing proportion of gas and air, the gas and air are brought to a corresponding pressure before their suction. This takes place by means of two suction and forcing appliances F G, constructed in the manner of gas-meters.

It is assumed that the pressure of the gas to be supplied drives both the suction and forcing drums, so that the energy inherent in the gas serves as the motor medium for increasing the pressure of the air. In this manner the advantage is obtained that the energy of the gas supplied may, it is said, be almost completely utilized, as by the suction effect of the suction and forcing apparatus A the driving of the two drums F G is maintained. In this case, gas and air are rendered available for the suction and forcing apparatus at equal pressures; so

that the quantitative proportions of gas and air do not alter in spite of varying consumption of the gas and air mixture.

The influences of variations of pressure in the gas supply pipe may be eliminated by conducting the gas through a pressure regulator before it reaches the pipe D and flows to the drum F. To this end a known pressure regulator, such as H, may be arranged in front of the pipe and connected with the gas supply pipe I.

In carrying the invention into practice in accordance with fig. 2, a double-acting supply pump J is provided, and by means of the two suction valves K L sucks the mixture of gas and air out of the suction-pipe M, and, by means of the forcing valves N O, supplies it to the service-pipe P. The suction and force pipes of the piston supply pump are also connected with circulation pipes in which a non-return valve is inserted at Q. This latter is connected (say) by means of the regulator R, with a pipe in communication with the service-pipe. So long as the valve Q is closed, and the communication between the suction valves K L and the forcing valves N O consequently interrupted, the normal supply takes place. If, however, the pressure in the service-pipe rises above a certain limit, with the consumption, the valve is opened—the more so the higher the pressure rises. By this means, the result is attained that, with an increase of pressure in the service-pipe, the supply furnished by the pump is influenced, inasmuch as the suction valves K L not only suck from the pipe M, but also a part of the mixture from the service-pipe P; and the quantity of the mixture sucked with each stroke increases with the increase of pressure – in this latter, as the valve Q is opened increasingly. By this means, it is impossible for the pressure in the service-pipe to exceed certain limits.

The gas, before it is available for the suction and forcing apparatus, flows out of the pipe S through a pressure regulator connected with the suction and mixing chamber T. Air is introduced into this chamber through U.

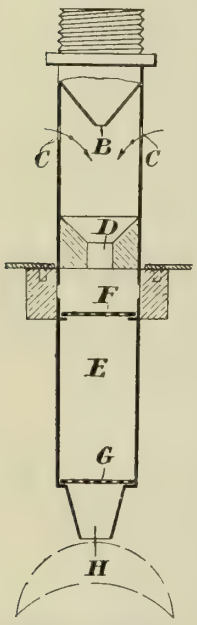
In order that with this arrangement likewise the gas and air may be supplied to the suction and forcing apparatus with corresponding pressures, the pressure regulator is of such construction that the gas reaches the suction-chamber through the pipe V without pressure; and, by means of special slides or valves, the suction orifices for gas and air may be appropriately regulated in cross section.

Incandescent Gas-Burners.

Dussert, C., of Lyons, France.

No. 2350; Jan. 30, 1906.

This incandescent gas-burner is intended for use with pressures exceeding 150 mm., and is more particularly suitable for working with an inverted flame or a flame downwardly directed at an angle of approximately 45°. The essential features of the burner consist, firstly, in a special ratio between the diameter of the injector-orifice and the diameters of the inlet and outlet orifices of the mixing-chamber, and, secondly, in the "total absence" of the noise produced in burners working at pressures exceeding the normal pressure of 150 mm.



Dussert's Incandescent Burner.

Gas at high pressure passes from the pipe, through the nozzle B, to the bunsen tube; the air required for combustion being sucked in through the orifices C. The air and gas pass together through the orifice D to the mixing-chamber E—traversing two discs of wire gauze F G, and then passing through the burner-orifice H. Taking the diameter of the orifice B as unity, the diameter of the orifice D is from 8 to 10, and the diameter of the orifice H from 10 to 12.

The purpose of the discs of wire-gauze is said to be to prevent the noise which usually attends the working of burners supplied with gas at high pressure. The discs are placed as far as possible apart, at the crests of two sound-waves.

To reduce the transmission of heat by conduction from the burner-orifice to the nozzle B (and so the expansion of the gas, the variation of the supply, and the loss of illuminating power), the burner-tube is made in two parts joined together by a ring or sleeve of heat-insulating material. A plate of mica is fixed to the ring to prevent the access of products of combustion to the air-holes.

If the burner is downwardly inclined at an angle of 45°, the mica plate and insulating-ring may be dispensed with; the mixing-chamber being bent to the desired angle. But the diameters of the orifices B, D, and H must always be in the ratio indicated.

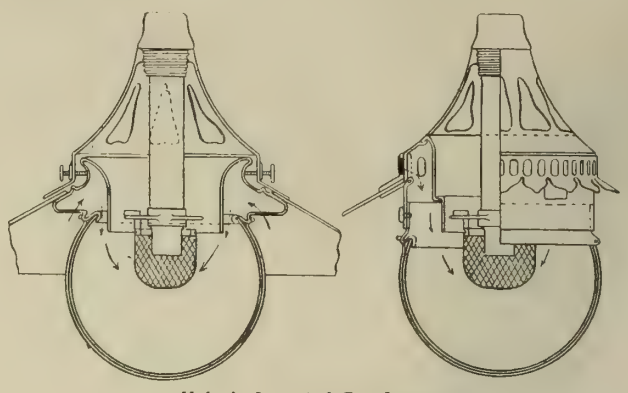
Inverted Incandescent Gas-Lamps.

Helps, G., of Nuneaton.

No. 213; Jan. 3, 1906.

This invention refers to globe and shade holders, suspenders, or attachments, made of specially constructed rings of metal, china, or other refractory material; the globes being secured to the rings by wire netting or other suitable means. The rings are so constructed that they can be secured to an ordinary globe holder by screws or a bayonet joint or the like, in which case the special ring is arranged to carry a shade in addition to the globe, and has provision for a chimney or draught inducer, together with air inlets, in such a manner that the globe needs no further opening for the supply of air to the burner and mantle.

The chimney or draught inducer passes over the mantle and burner-tube, and is secured to the holder by a bayonet joint. Around the edges of the holder air inlets are arranged, and the holder may also have hinged rests on which shades can be fixed—the object of the hinges on the shade rests being to allow the shade to pass from the under side over them. The draught inducer may, in addition to being attached to the holder by a bayonet joint, be telescoped so that the mantle may be attached to the burner-tube higher up than it could otherwise be.


Helps's Inverted Gas-Lamps.

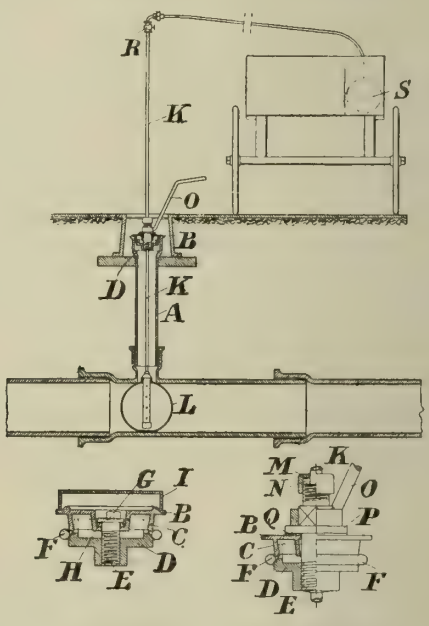
The first illustration shows (in section) a combined globe and shade supporting ring and draught inducer secured to an ordinary holder by means of screws; while the second shows (partly in section and partly in elevation) another form which the invention may take. In this case, the globe only is secured to a plain metal ring, which is attached to the holder by a bayonet joint locked by a set-screw. The draught inducer is telescopic, and is fixed to the holder by a bayonet joint. The shade is carried on hinged supports, which fold back for the purpose of fixing the shade in position.

Plugging Gas-Mains.

Marchand, E., of Strassburg, Germany.

No. 17,085; July 28, 1906.

This invention relates to devices for readily and speedily plugging large gas-pipes (such as street mains), in the case of accident, breakage of the pipe, or when repairs or additions are necessary—the stoppage being effected without first exposing the pipe. The device employed consists of a charging cap for closing the outlet aperture of the main or pipe through which the plugging device is introduced.



Marchand's Gas-Main Plugger.

The illustration shows a gas-main in section and partial elevation plugged by means of the device; a section through the closing cap; and the charging or filling cap in elevation and partial section.

From the main to be operated on by means of the device, a branch pipe A proceeds vertically upwards to just below the level of the road, and terminates in a street plug. Under normal conditions, the outlet aperture of the pipe is closed by the cap shown. A cover B engages the valve disc D with its edge C; a screw thread in the disc serving as a nut and guide for a spindle E by means of which the two parts are connected. A packing ring F is arranged around the valve disc. When it is desired to cause the main to be gas-tight, the spindle is loosened, and the closing cap placed upon the mouth of the pipe; the cover B bearing against the upper edge of the pipe. If the spindle E is now tightened up, causing the valve disc to enter the cover B, the packing ring F is pressed against the walls of the pipe, thereby forming a tight joint. The shoulder G of the spindle presses on an india-rubber ring H, so that a tight joint is also formed at the place at which the spindle passes through the cover. A cap I, placed over the whole, prevents any access of water or dirt.

When it is desired to cut off the gas supply, the charging cap referred to is employed; the spindle E being somewhat transformed. A pipe K passes through the spindle; and at its lower outlet a ball or bag L is fixed. The spindle-head is formed in such a manner that a cap M may be screwed on it, closing the inlet to the pipe K by means of an india-

rubber washer N. Below this cap the spindle is made square, in order that it may be tightened up by means of a spanner O, whereupon its shoulders P press the india-rubber ring Q lying beneath it against the cover—thereby making a tight joint at this aperture also. Above the charging cap, the pipe K may be closed by means of a cock R.

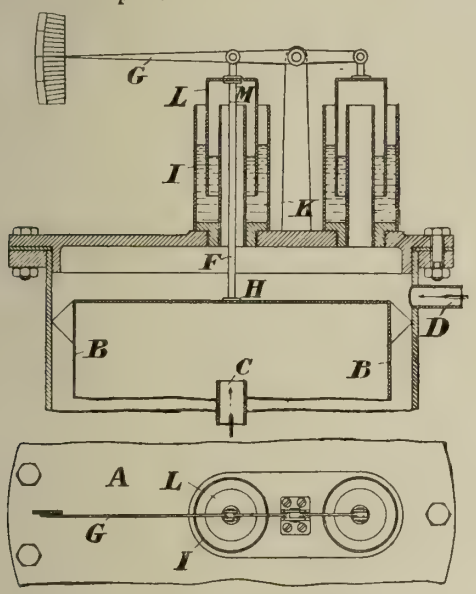
If, owing to accident, it is desired to block a gas-main, a truck, kept permanently ready and fitted with india-rubber balls, charging nozzle (with tube and cocks), and also with a carbonic acid container, is brought to the spot. In the first place, the spindle E is loosened; so that the tube with the india-rubber ball L suspended from it may be passed through the branch pipe into the main. The cover B is arranged upon the mouth of the pipe, whereupon the spindle is tightened so that the packing ring F is pressed against the wall. When the cap is made fast, the pipe K is connected with the ready-charged carbonic or compressed air container S, and the cock R is opened so that the ball L is inflated by the pressure of the gas in the container, and the main thereby plugged.

Measuring Gas Pressures.

Bruyn, P. de, of Düsseldorf, Germany.

No. 24,047; Oct. 29, 1906.

Ordinary apparatus for measuring gas pressures (comprising a rod or rods extending to the outside of the apparatus through a liquid seal of the bell type) are, the patentee says, liable to give erroneous indications, varying with the fluctuating gas pressure acting upon the inside of the seal bell—an error which becomes of importance in the case of differential pressure measurements and scientific observations. His invention is intended to obviate completely this liability to error by the provision of an improved liquid seal, shown in vertical central longitudinal section and in plan.



De Bruyn's Gas-Pressure Measurer.

The measuring vessel or pressure chamber contains a bell or float B, of any suitable kind, which varies its position under the influence of the gases admitted through the inlets C and D. The movement is transmitted by the rod F to the pointer G. For the purpose of sealing the space H from the atmosphere, there is employed a liquid seal of the ordinary bell type, consisting of two tubes I and K mounted one within the other on the cover of the chamber. In the space between these two tubes is liquid, into which dips a cylindrical bell L (open at its lower end) attached to, and which surrounds, the rod F.

It is obvious that in this arrangement the bell L is caused, by the varying gas pressure in the space M below it, to exert an influence upon the movement of the rod F, which will affect the indications of pressure to an extent that will be the greater, the greater the fluctuations of pressure transmitted through the inlet D, and the smaller the difference between the pressures at the inlets C and D. But to obviate this influence by means of a counteracting influence, the bell L is connected to the bell of another similar liquid seal having the same cross sectional area and communicating with the same pressure chamber, in such a manner that the gas pressures acting upon the two bells counteract each other.

To carry out this idea there is a two-armed lever fulcrumed on a support between the two bells; the arms being pivoted to the two bells respectively. One arm may be extended as shown to constitute a part of the pointer G, which indicates the pressure or the difference between the pressures.

APPLICATIONS FOR LETTERS PATENT.

29,314.—Bourcoud, A. E., "Manufacture of producer or kindred gas." Dec. 22.

29,335.—Helps, G., "Lamps and burners." Dec. 24.

29,337-8.—Wright, J. W. B., and Darwin, H., "Incandescent burners." Dec. 24.

29,344.—Drabble, H., "Gas-heated radiator." Dec. 24.

29,396.—Barker, F. W., and White, T. L., "Producing gas for power." Dec. 24.

29,407.—Maschinenfabrik Oerlikon, "Gas-turbines." Dec. 24.

29,471.—Wilson, A., "Gas-washing machines." Dec. 27.

29,573.—Glover, T., "Anti-vibration appliances." Dec. 28.

29,599.—Drinkwater, T. W., and O'Connor, H., "Reducing the arsenic in gas and other cokes." Dec. 29.

29,752.—Feld, W., "Recovering tar and ammonia from coal gas." Dec. 31.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS CONTROVERSY.

The Local Government Board Decline to Direct an Inquiry.

At a Meeting held by the Nottingham City Council yesterday, it was evidenced that there is now a disposition in certain quarters to wind up with the least possible delay that which relates to the local gas controversy. Whether, however, this will be accomplished, next Monday's vote will determine. The reply of the Local Government Board was read at yesterday's meeting. It was signed by Mr. H. C. Monro, one of the Assistant-Secretaries, and was in the following terms:

> I am directed by the President of the Local Government Board to advert to your letter of the 16th of November last, requesting him to order an inquiry into certain matters affecting the gas undertaking of the Town Council of Nottingham, and to state that Mr. Burns has given the matter careful consideration; but, as the Board has no statutory power to hold such an inquiry as is desired, or to summon witnesses and require evidence to be given on oath, or to take any administrative action as a result of an inquiry, he is not prepared to direct one.

The alternative course of calling in either Sir Hugh Owen or Sir Albert Rollit to conduct an investigation is one, it will be remembered, to which the Corporation still remain committed; but the disposition of some to close the controversy was indicated by the acceptance by the Council of a resolution moved by Mr. A. W. Black, M.P., for holding a special meeting next Monday to consider a motion that no further steps be taken in the matter. Whether the general body of ratepayers, whose desire for fuller information has been abundantly manifested, will look at the case in the same light, remains to be seen.

GAS AFFAIRS AT LLANDUDNO.

Resignation of the Manager.

Last Thursday, the Llandudno Urban District Council held a special meeting for the purpose of considering the resignation of the Gas Manager, Mr. Thomas Davies. At a meeting of the Gas and Electricity Committee on the 20th ult., Mr. Davies tendered his resignation, and handed his keys to the Chairman of the Committee (Mr. M'Master). The latter was empowered to arrange for the temporary management of the works; and the question of the acceptance or otherwise of the resignation was referred to the special meeting of the whole Council. Since the Committee meeting, there has been some feeling in the town that Mr. Davies ought to be asked to reconsider his action; but against such a course being taken by the Council, a petition was promoted and signed by some forty of the principal ratepayers.

After some protest on the part of signatories to the memorial who were present in the gallery, it was resolved that the Council should go into committee. An hour-and-a-half later, the Press and public were invited to return to the chamber; and then Mr. M'Master moved the following resolution, which was carried unanimously: "That the resignation of the Gas Manager be accepted, the same to take effect from Jan. 20. That the Water and Gas Committee be authorized to permit the Manager to occupy his present residence for such period after that date as the Committee in their discretion think fit, with full power to act in the matter, and make such terms as they deem advisable." In proposing the resolution, Mr. M'Master said: "Perhaps, after the full discussion we have had, it is not wise to say anything more. I think the best plan is to leave the thing as it is and let subsequent events follow."

It is understood that the memorial against Mr. Davies being asked to reconsider his resignation was read to the meeting in committee; and that no similar communication had been received from the opposite party. The arrangement as to him being allowed to remain in the residence provided by the Council, is due to the illness of his wife.

NOTIFICATION OF ACCIDENTS ACT.

Our readers are aware that one of the measures which received the Royal Assent on the last day of the session just closed was the Notice of Accidents Bill. It amends the law relating to returns and notifications of accidents in mines, quarries, factories, and workshops, and under the Notice of Accidents Act, 1894.

Sections 1 and 2 refer to accidents in mines and quarries; and section 3 deals with railway sidings in connection with them. The next section, however, relates to factories and workshops. It sets forth that where any accident occurs therein which (1) causes loss of life to a person employed, (2) is due to any machinery moved by mechanical power, or to molten metal, hot liquid, explosion, escape of gas or steam, or to electricity, and so disabling any person employed as to cause him to be absent throughout at least one whole day from his ordinary work, or (3) is due to any other special cause which the Secretary of State may specify by order, and causing such disablement, or (4) disables for more than seven days a person employed from working at his ordinary work, written notice of the accident, in such form and accompanied by such particulars as the Secretary of State prescribes, is forthwith to be sent to the inspector of the district, and also in the case of the accidents mentioned in paragraphs 1 and 2, and, if the order of the Secretary of State specifying the special cause so requires, of accidents mentioned in paragraph 3, to the certifying surgeon of the district. If any accident causing disablement is notified under this section, and after notification results in the death of the person disabled, notice in writing of the death is to be sent to the inspector as soon as the death comes to the knowledge of the occupier of the factory or work-

shop. If any notice with respect to an accident in a factory or workshop required to be sent is not sent, the occupier of the factory or workshop is to be liable to a fine not exceeding £10. If any accident to which this section applies occurs to a person employed in a factory or workshop the occupier of which is not the actual employer of the person killed or injured, the actual employer is to immediately report the same to the occupier, and in default shall be liable to a fine not exceeding £5. These provisions are to be substituted for section 19 of the Factory and Workshop Act, 1901.

By section 5, if the Secretary of State considers that, by reason of the risk of serious injury to persons employed, it is expedient that notice should be given under the Act in every case of any special class of explosion, fire, collapse of buildings, accidents to machinery or plant, or other occurrences in a mine or quarry, or in a factory or workshop, including any place which, for the purpose of the provisions of the Factory and Workshop Act, 1901, with respect to accidents is a factory or workshop, or is included in the word "factory" or "workshop," or is part of a factory or workshop, the Secretary of State may by order extend the provisions of the present Act requiring notice of accidents to be given to an inspector to any such class of occurrences, whether or not personal injury or disablement is caused; and, where any such order is made, the provisions of the Act are to have effect as extended by the order. The Secretary of State may by any such order allow the notice of any occurrence to which the order relates, instead of being sent forthwith, to be sent within the time limited by the order.

It is specified in section 6 that section 1 of the Notice of Accidents Act, 1894, is to be read as if the words "cause him to be absent throughout at least one whole day from his ordinary work" were substituted for the words "prevent him on any one of the three working days next after the occurrence of the accident from being employed for five hours on his ordinary work" in sub-section 1 of that section.

The Metalliferous Mines Regulation Act, 1872, the Coal Mines Regulation Act, 1887, the Notice of Accidents Act, 1894, the Railway Employment (Prevention of Accidents) Act, 1900, and the Factory and Workshop Act, 1901, are repealed to the extent specified in a schedule.

THE "ENGINEER" ON GAS PROGRESS LAST YEAR.

In the course of their review of the progress of the gas industry in the past year which appears in the current number of the "Engineer," the following remarks occur.

The most noteworthy feature of the year, in regard to the internal economy of gas-works, was the simplification of the purification of coal gas in the Metropolitan and many other large works, consequent on the removal of the obligation under which they formerly laboured to extract from the gas, prior to distribution, sulphur compounds other than sulphuretted hydrogen. The necessity for the use of lime as a purifying material thereby ceased; and the Gas Companies no longer had to deal with the difficult problem of the disposal of the fouled lime. Moreover, upwards of 2 per cent. more gas became available for sale, without increase in the amount of coal carbonized, owing to the carbonic acid which had been extracted by the lime now remaining in the gas. On the other hand, the extraction of cyanogen compounds from coal gas, which involves a more or less independent treatment of the gas, became more widely practised. It is noteworthy that, apart from a very partial recovery of cyanogen from the spent oxide of iron from the purifiers, the Gaslight and Coke Company were two or three years ahead of other gas undertakings the world over in the practical application of a cyanogen-recovery process to coal gas; and it was only by slow degrees that the recovery of this valuable bye-product became at all commonly practised in other gas-works. The manufacture of carburetted water gas, of which the same Company were likewise the pioneers in this country, has continued in favour, wherever the requisite plant had been erected, as a valuable adjunct to the staple supply of coal gas. In the first instance, carburetted water gas was adopted primarily with the object of enriching the coal gas; but the necessity for such enrichment has now passed away in consequence, in many cases, of the reduction of the illuminating power prescribed by statute, and in other cases by the adoption for testing purposes of the "Metropolitan" argand burner No. 2, which ascribes to the gas a considerably higher illuminating power than the older testing burners. Carburetted water-gas plant, however, has continued to be used because it is more readily put in and out of action than coal-gas plant, and thus is better adapted for meeting the fluctuations in the demand for gas from day to day, while it relieves the coke market, which is so commonly overstocked, of a considerable proportion of the works' make of coke. The proportion of carburetted water gas made in the United Kingdom now exceeds 12 per cent. of the total amount of gas sold.

Unprofitable Electric Lighting at Southend.—Th Auditor's report on the accounts which came before the last meet n of the Southend Town Council showed, with respect to the electric lighting undertaking, that, though the income from the sale of electricity and meter-rents had been steadily rising, yet a net profit three years ago of £358 was converted into a loss of £732 the following year and of £1007 last year. This was chiefly due to the increase in the loan charges; but there was also a noticeable increase in the bad debts.

Big Water-Main Bursts at Coventry.—The bursting of a 14-inch water-main caused a considerable amount of trouble at Coventry on Christmas Day. In the early morning, the official in charge of the Parker Butts reservoirs noticed that the water had sunk 9 feet in one of the reservoirs—a deficiency representing about 2 million gallons of water. Immediate communication was set up with the water-works officials and the heads of departments; and workmen were hurriedly summoned. At first it was a mystery where the water had gone; but after considerable search, the fracture of the main was discovered. This has been followed by a second breakage in the same main, and near to the spot where the first fracture occurred. The mishap is attributed to the vibration of the traffic, which is very heavy in the street where the accident occurred, as the electric tram service runs down this thoroughfare.

GAS SUPPLY ON THE PACIFIC COAST.

Some Strange Gas-Making Materials.

At the last Meeting of the Pacific Coast Gas Association, Mr. G. P. Low, the Association's Historian, presented some notes on the gas supply in certain cities in the area from which the membership is mainly drawn. They contained some interesting particulars, from which we make the following extracts.

Nevada City is entitled to the distinction of possessing the third works erected in California for the manufacture of artificial gas; its predecessors being the San Francisco Gas Company, which began operations on Feb. 11, 1854, and the Marysville Gas Company, which dates from 1858. The Nevada City Gas-Works (which afterwards became incorporated as the Nevada City Gas Company) were built in 1859; thus outranking Portland (Ore.), which started in 1860, and San José, Napa, Oakland, and Stockton, which followed, in the order named, shortly after. The works were built by Messrs. J. S. Kaneen and A. Pierce with their own hands, with the assistance of a single helper. They punched and riveted the holder, dug the tank to contain it, and built the benches, condenser, scrubber, and purifier—in fact, the whole of the works. It was a coal-gas plant, containing two retorts in a setting, of which there were two. The retorts were 6 or 7 feet in length, 24 inches wide and 12 inches high. The condenser was made of 3-inch cast-iron pipe, standing about 3 feet high, with eight or ten bends. The purifier was a simple wooden box, 4 ft. by 6 ft., and 3 feet deep, in which red lime was used as the purifying agent. The scrubber was of iron, also 4 ft. by 6 ft., but standing several feet high. Near the top was placed a tank of cast iron, the bottom of which was perforated, so that the water would run through. The washer was similarly built, with the exception that it contained limbs and branches of trees in short lengths, as well as coke; for the scrubber and washer were separate pieces of apparatus. From the washer the gas was taken direct to the holder, which had a capacity of 4500 cubic feet. Gas was made of pitch pine and resin oil; the pine wood being cut into sticks 1 inch square and 4 feet long. These were put into formers, consisting of ⌂-shaped loops of wrought iron, so as to shape the bundle into a form that would fit closely into the retort. Before being put in, however, each bundle was saturated with resin oil; the period of retorting lasting for about 1½ hours. The distributing system consisted of some 2 miles of 3-inch cast-iron mains; the holder pressure being 20-10ths. The burners used were 8 and 10 feet. At the outset, gas was sold for $5 per 1000 cubic feet, which was regarded as a fair rate, in view of the cost of wood, which probably averaged $11 per cord for selected pitch pine. After completing the works, Mr. Kaneen remained to superintend them until 1863, when he went to Virginia City to supervise the erection of gas-works there. As time wore on, the concern passed into the ownership of the California Central Gas and Electric Company on Oct. 1, 1899. At that time illuminating gas sold at $5 and fuel gas at $3 per 1000 cubic feet, in contrast with the present rates of $2·50 and $2 respectively.

At Petaluma, the gas-works were all but a disheartening failure from their inception. As originally installed by the late Mr. Peter Donohue, about the year 1867, they at the very outset encountered such an insuperable obstacle in the high price of materials, that the public would not buy gas at the figure charged; so the plant was closed down after running a comparatively short time. After a period of idleness, the plant was bought by a Mr. Farmer and some associates, who moved it to the lower part of the town, on Petaluma Creek, where the new works were erected. By the time of their completion, the business had been incorporated under the name of the Petaluma Gaslight Company, which continued in existence until the latter part of 1900, when it was purchased by the Petaluma Gas and Electric Company—thus putting an end to a long period of warfare, and for the first time effecting a combination of the gas and electric light interests of the town. In Mr. Donohue's original gas-works, about 2 miles of cast-iron mains, in 6-feet lengths, brought from Scotland, were used. They were 4 inches and 6 inches in diameter; and though they had been in the ground for upwards of thirty years, when taken up a few years ago they were still in very good condition, with the exception of certain lengths that had been in very low ground. In these cases the percolations of the brackish water of the creek had destroyed some of the pipe. The writer is not able to state what the price of gas was during Mr. Donohue's time; but in 1880 it was selling at $10 per 1000 cubic feet. It was afterwards reduced to $8; then to $6, in 1887; later to $5; and finally, in 1899, to $2 for lighting and $1·50 when used for fuel.

It was probably prior to 1887 that the plant passed into the hands of Mr. I. G. Wickersham, the banker of Petaluma, who enlarged the system by laying more mains about the town. Coal gas was still being made, according to the old system installed by Mr. Donohue, when, in 1897, Mr. F. W. van Syckle succeeded in inducing Mr. Wickersham to allow him to change the coal-gas to an oil-gas system, using crude coal oil to generate gas through the medium of the Van Syckle process. The change was made as recommended. About 30 gallons of oil were consumed per 1000 cubic feet of gas manufactured; but most of it was used in heating the blast-furnace. The quantity of gas produced per day varied from 4000 to 4500 cubic feet; its illuminating power ranging from 23 to 24 candles. The Van Syckle process was interesting, even if neither satisfactory nor profitable. In the gas which it produced a certain percentage of air was allowed to enter and mix with it in a simple mechanical combination. Then in the evening, anywhere at the centre of distribution, or thereabouts, the gas-jets in the stores would first whistle and burn together, then pop and revive and whistle again. Yet at other times, when the conditions were right, a fair illumination would be given; but there would always be cast over everything a pall of lampblack and soot. These conditions were tolerated until 1902, when the Van Syckle plant was supplanted by the Santa-Rosa-Petaluma gas transmission system. In the meantime, with the acquisition of the Petaluma Gas Company by the Gas and Electric Company in 1900, and the absorption of the last-named concern by the California Central Gas and Electric Company a year later, the lighting and power industries of Petaluma passed under the control of the California Gas and Electric Corporation.

The city of San Rafael became possessed of gas-works about 28 years ago, when a gas, by courtesy called an illuminant, was made from gasoline, in small works which supplied a few blocks along the principal streets. A few years later, the works were bought by Mr. E. Lee, who moved them to their present position. On this property there was first erected a small holder supplied with coal gas from three small settings of a like number of retorts each. It was a good gas, running to 22-candle power, and was made from Wallsend coal and purified with lime. The mains were extended up to a junction with the 3-inch mains that formerly distributed gasoline along the principal street; and later they were continued over the best sections of the city in all directions. About this time, the San Rafael Gas Company was organized. Gas was sold for $4 per 1000 cubic feet at the outset; but later it was reduced to $3·50, at which price it proved so popular as to necessitate repeated extension of the works—first by settings of 6 retorts, then by another, and later two of the original settings were taken down and another of 16 retorts was erected. Some five years ago, oil gas was introduced; the present equipment consisting of two sets, which produce 130,000 cubic feet and 80,000 cubic feet respectively, of 22-candle power gas per day of 20 hours.

The first gas-works erected in Santa Rosa were located in a frame building, since burnt down, where gasoline gas of the Maxim type was made, eventually to an output of from 10,000 to 12,000 cubic feet per day. Mr. Kaneen is the authority for the statement that this plant was started on the 15th of April, 1872, and that gas was then sold at $4 per 1000 cubic feet. No record of the performance of the works was ever kept. After a couple of years, the works were moved to a site that is now within the premises constituting the works of the Santa Rosa Lighting Company. About 1875, the system was changed to a coal-gas plant originally using Wallsend coal costing $14 a ton, and another Australian, or possibly a Japanese, coal that contained an inordinate amount of sulphur. The works contained three cast-iron Ω-shaped retorts, a condenser consisting of 6-inch iron pipes 12 feet high, and a wooden box purifier in which slaked lime was used as a purifying material. A 20-candle power gas was produced.

In the meantime, the business had been incorporated as the Santa Rosa Gas Company. In 1876, Mr. Kaneen acquired an interest in the Company, and shortly thereafter another setting of retorts was added. The comparatively high price of coal made gas an expensive commodity, and much was done under Mr. Kaneen's direction to reduce the cost of its production. For an entire year later in the seventies gas was made exclusively from the wood of the red fir, costing approximately $10 per cord delivered at Santa Rosa. This was very choice wood, especially selected from old trees that were rich in resin, with the result that from 14,000 to 18,000 cubic feet of 20-candle gas were made from a cord. Some pitch pine was also used: but it was very expensive, though it produced no less than 23,000 cubic feet of gas per cord. This statement is, however, merely an estimate, for the pitch pine yielded gas so rapidly that it was not possible to measure it accurately with the facilities at hand.

For a time gas was made from the refuse of the vineries and vineyards thereabouts. Grape vines, sticks, stalks, leaves, and litter would be collected from the vineyards, and the pulp and seed from the crushed grapes would be removed from the vineries and spread out in the sun to dry. It was a hard task to dry this material thoroughly—in fact, drying was the main difficulty in using it; but once dried and used as wood in the retorts, it would yield from 5000 to 7000 cubic feet of 18-candle gas per waggon load. It was while using this refuse that Mr. Kaneen resorted to the use of crude oil to assist the production of gas. Special pots of cast iron, measuring 12 in. by 14 in. by 8 in., were made, and filled two-thirds full of crude oil, then levelled off to the top with sawdust, and one put into each retort. The latter was then filled with the refuse, or with turf, sawdust, wood, or "any old thing," and a good gas—also much tar—would result. The oil would be consumed down to a honeycomb sponge-like mass, which would cover the bottom of the pot to a depth of an inch or more. Oil-pots were sometimes used in making gas from wood; the material being sawn up into strips about an inch square and 4 feet long. Wood costing $4 a cord, and preferably of fir, could be used advantageously. Peruvian oil, costing $2·25 per barrel in San Francisco, was employed exclusively. It should be emphasized that the making of gas from these materials was not done from choice but from necessity, owing to the absence of what might be termed legitimate gas-making materials. Indeed, the use of grape pomace, &c., was not only unprofitable, but the pomace would cool the retorts to such an extent that gas could be produced only with exceeding difficulty.

The gas so made continued to be sold at $4 per 1000 cubic feet, with a special price of $3·50 to large consumers, until 1886, when it was reduced to $3 50 and $3 respectively. In 1880, the distributing plant consisted of about 3 miles of mains, from which were supplied some 125 consumers. The Company pursued an even course until 1886, when the advent of the electric light in Santa Rosa brought about a warfare which gave rise to fallacious beliefs on the part of the public that required almost 15 years of bitter struggle to eradicate. The history of the lighting industry in Santa Rosa is therefore replete with interest, inasmuch as it gives instruction regarding some of the most egregious errors that may be committed by a well-intentioned but misguided public.

Stockport Gas Committee and the Ironmongers.—The Stockport Gas Committee have abandoned a proposal to take a shop as a show-room for stoves and gas fittings. The scheme was opposed by the Tradesmen's Association, as being against the interests of certain shopkeepers, and in the direction of unnecessary municipal trading.

Belfast Gas Managership.—The Belfast County Borough Council have adopted the resolution of the Gas Committee appointing Mr. Robert Sharpe as Manager in succession to Mr. James Stelfox, at a salary (as mentioned in the "JOURNAL" for Dec. 18) of £700 per annum, with free house and grounds; and they have added to this a free supply of gas. A suggestion that the appointment should be made without the right to a pension, was defeated by a large majority. At the same meeting, the Council confirmed their resolution to grant Mr. Stelfox a retiring allowance of £800 per annum.

DEVONPORT CORPORATION WATER SUPPLY.

The New Bill.

A resolution approving of the promotion of a Bill, the principal object of which is to confer powers for the improvement and development of the water supply of the borough, was carried with practical unanimity at a meeting of the Devonport Town Council last Thursday. The only question raised was in regard to the clause under which power is to be asked to increase the water-rentals of a certain class of property. The Town Clerk explained that this question could be more conveniently discussed at a subsequent meeting, and notice was thereupon given to delete the clause referred to. A meeting of the Mercantile Association was held the same day to consider the matter. The Chairman (Mr. F. R. Charlick) stated that the Executive Committee of the Association had come to the conclusion that the action of the Town Council ought to be supported. Before arriving at this decision, they appointed a deputation, who waited on the Water Committee and gathered a good deal of information. One point which had great weight with the Executive Committee was the fact that it was very important that the town should be in a position to fulfil the demands which the naval and military authorities might make upon them at any time for the supply of water, and that there should never be any excuse for the Government doing anything with which they did not agree, because of any difficulty about the Corporation being able to supply what was needed. Mr. E. Loram, the Secretary of the Association, submitted the report of the deputation who waited on the Water Committee. They said it was generally conceded that the huge wastage of water, amounting to about a million gallons a day, should be stopped; and therefore the work of piping and blocking portions of the existing leat, and possibly the construction of an additional filter-bed, became a recognized necessity. With regard to constructing an additional reservoir, the Water Committee had pointed out to the deputation that the present storage accommodation amounted to an eight or ten days' supply, and that on several occasions during the past year it had been perilously near exhaustion. The Council are under contract to supply the Admiralty with 480,000 gallons per day. The Admiralty are now taking 180,000 gallons a day in addition to the quantity contracted for; and it is expected that, on the completion of new works now in progress, a further 40,000 gallons will be required. Mr. C. M. Bartlett referred to the recent blocking of the leat with snow as evidence of the need of increasing the storage accommodation. They ought, he said, to have an additional reservoir, and not run the risk of a water famine through having so many miles of open leat. After some conversation on the subject of charging for water by meter, a resolution approving of the Corporation's action in the promotion of the Bill was carried unanimously.

BLYTH COUNCIL AND LORD RIDLEY'S WATER-WORKS.

At the Meeting of the Blyth Urban District Council last Thursday, the Clerk (Mr. T. R. Guthrie) read a letter from the Local Government Board stating that they had had under consideration the Council's letter of the 7th ult. with reference to the application for sanction to borrow money for the purposes of water supply, including the purchase of the water-works belonging to Lord Ridley. The Board adhered to the view that the Council were paying a high price for the undertaking it was proposed to purchase; but, looking to the position in which they had placed themselves, the Board would not refuse to sanction a loan. The Board had considerable hesitation, however, in arriving at the decision that the case was one in which they were justified in taking this course. Their formal sanction to the purchase of water-works and to the borrowing of the sum of £9050 to defray the amount to be paid to Lord Ridley, with the costs of the transfer of the undertaking, were forwarded, together with authority to borrow £4118 in respect of improvements of the existing mains and the laying of the proposed 9 inch and 3 inch mains, and the sum of £750 to meet the prospective expenditure on extensions. The Board excluded £70 required in respect of the meter-house and site, as they did not think sufficient evidence had been produced to show the necessity for this amount. The Chairman (Mr. J. Goulding) said he considered the letter a satisfactory outcome of their long trouble. He pointed out that they were getting water for 5½d. per 1000 gallons, whereas in some other districts 1s. 6d. was being charged to traders. The agreement to purchase the works was signed on behalf of the Council; and the question of a meter-house and site was left with a Committee.

POLLUTION OF WATER SUPPLIES BY RAILWAYS.

In the course of the Presidential Address delivered by Professor W. T. Sedgwick at the last annual meeting of the New England Water-Works Association, he dealt with the important subject of the protection of public water supplies from pollution during the construction, maintenance, and operation of railways. The address, which was accompanied by voluminous appendices, has lately appeared in the "Journal of the Association;" and the following remarks upon it have been made in "Engineering Record." In his address, the author sounded a strong note of warning against lax sanitary regulations regarding railway trains and railway property within the drainage areas of municipal water-works. It appears that theoretical studies did not suggest it as a topic of discussion, but it resulted from a strong popular outcry in Seattle against the possible pollution of its water supply.

In the Pacific extension of the Chicago, Milwaukee, and St. Paul Railway, the line runs for 11 miles very near the Cedar River, whence the water for Seattle is drawn. A large part of the land along the river is owned by the city; and it was proposed to secure the necessary right-of-way by means of a municipal ordinance prohibiting the

construction of stations along this slip without the city's consent, and providing for the exclusion of all polluting matter from water during and after the making of the road. The proposed ordinance was a great advance in its sanitary requirements over anything previously drawn up; and all who were concerned in its preparation were congratulating themselves on having agreed on requirements far more stringent than anything before adopted, when a vigorous protest against it began to appear. The people of Seattle take great pride in their water supply, and they rose in a body to defend it. Social and political clubs, the Chamber of Commerce, and other organizations protested against the ordinance; and finally the County Medical Society obtained an injunction restraining the Mayor from signing the deeds. The railway authorities were thus compelled, in self-defence, to retain experts to investigate the problem of constructing the road and operating the trains in the valley in such a way as to keep the water free from pollution. Among those selected was Professor Sedgwick; and it was finally agreed to leave the decision to a Commission consisting of this gentleman, Professor A. C. Abbott, of the University of Pennsylvania, and Professor C. Harrington, of Harvard University. These specialists reported that it was possible to construct and operate the road without danger to the water supply.

In Professor Sedgwick's address he advocated the use on passenger and freight trains of sewage tanks or equivalent receptacles which can be emptied at regular stations. Their use was advised on the ground that nothing of the nature of closet wastes should be dropped on a railway track. Our contemporary believes that such a proposition is not only impracticable but unnecessary, as such matter falling on a track is rapidly absorbed. It is considered that it will do no harm, except where the tracks are within the catchment areas of water-works, and that the danger of pollution may be better avoided by specal construction within each drainage basin that must be protected. This, indeed, is well shown in the report of the Commission of which Professor Sedgwick is a member. Wherever the soil between the road bed and the body of water is devoid of those properties which make it an efficient filter, the road bed can be trenched, and the trenches filled with gravel and sand, and dykes can be constructed to prevent surface wash. The bridges can have steel decks ballasted with gravel and sand, and drained to points beyond the river banks, where the discharge from the pipes can be received on areas of suitable natural soil or else artificial filters. Construction camps can be maintained in a sanitary condition which will keep the water supply free from contamination, and the men engaged in maintenance work can be made to take an intelligent interest in preventing pollution from their own huts, and also by occasional visitors to the district. These are all things that can be done efficiently, as the Commission point out.

Street-Box Explosions at Wolverhampton.—The pedestrians in Victoria Street, Wolverhampton, last Tuesday afternoon, had a surprise which fortunately did them no harm. Two electric street-boxes have lately been put into the pavement, and on the above-named day the lids of both, as if by mutual consent, shot into the air with a loud report, which was followed by an outburst of flame from the boxes. It is stated that an official inquiry showed that gas had accumulated from a defect in the mains, which run near the electric cables; and it had probably been fired by the fusing of a wire.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A week ago, there were many snowed-up railway trains in Scotland. In some cases, passengers were obliged to spend the time of delay in the trains; and I have read, in more than one instance, of the discomfort endured by the occupants of the carriages on account of the lights in them going out after a time. In one case, this happened at midnight; and in another, at two o'clock in the morning. After these hours, the unfortunate passengers had to endure the weary, cheerless time in cold and darkness. The lights referred to must have been gas-lights; for, in the case of electric lighting, with current derived from the revolving axles, the light would have failed a few minutes after the train came to a standstill. I have been in electrically lighted trains, in which the lights only reached their utmost brilliancy after a considerable speed had been attained; and if a stoppage of any duration took place, the lights went down, and threatened to go out altogether. Most people accustomed to travel would, I presume, if they feared a snow block, prefer a gas-lighted train, as there would be a likelihood of the period of maximum discomfort not arriving so soon as it would if electricity were used.

In the Kirkcudbright Town Council last week, Bailie Nicholson said that a matter which was a source of great annoyance, and one calling for serious consideration, was the state of the gas at the present time. He wondered whether something might not be wrong with the sewers, but had found that it was simply the gas. Provost M'Ewen said they were all in the same boat. He had been nearly driven out of his house. The new purifiers, however, when in order, would put matters all right. Bailie Nicholson remarked that he would like it to go forth to the consumers of gas that things would soon be straight.

Andrew Moir, seaman, and his wife, an aged couple who lived at No. 2, St. David's Lane, Dundee, were found dead in bed on the morning of the 1st inst. They paid a visit to a friend on the evening of Saturday, the 29th ult., and returned home at a late hour. They were not again seen alive. On Tuesday morning, a neighbour went into their house, to "first-foot" them on the New Year morning. The occupants were in bed, and both dead. The room in which they lived was lighted by gas, which was supplied through a prepayment meter. The pipe connecting the meter was found to be extensively fractured; and gas was escaping in large volume. The gas was turned on at the burner, but was not lit; the theory being advanced that it had been alight, but had gone out for want of oxygen. This view appears to be given with some authority, because it is stated that Mr. A. Yuill, the Gas Engineer, visited the house and examined the fittings. Another theory which is put forward is to the effect that probably a crooked penny stuck in the meter; and that it had been shaken, in order to release the coin, with the result that the pipe was broken. This would seem to point to the meter having delivered its full tale of gas, and to the light having then gone out; and the probability would then be that the shaking took place in the dark, with the consequence that the damage done was not observed. Whichever way the matter is explained, it is evident that the incident reveals a source of danger in the use of prepayment meters. It is only by painful experience that such lessons are learned—the more is the pity; and every scrap of such

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 82.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20½—21½	+½	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6½—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne-mouth Gas & Water } 10 p.c.	28—29	..	4 16 7
51,810	10	,,	7	B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9½	Do. New	200—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	230—235	..	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	41—43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9¼—9¾	−¼	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98*	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107—110	..	4 10 11
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas-light and Coke } 4 p.c. Ord.	99—100	+½	4 8 0
2,600,000	,,	,,	3½	3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 13	3	3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	177—179	−½	4 9 5
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	0	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	229—231	..	4 6 7
718,100	,,	,,	7	Do. B	167½—169½	..	4 3 1
144,140	Stk.	Sept. 13	7⅝	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110—112	−1	4 2 7
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97*	−¼	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅜—14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	5½—6½	..	5 12 0
398,490	5	Oct. 26	7	Primitiva Ord.	7¼—7⅝	..	4 10 4
796,980	5	July 27	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12⅝	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97*	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13¼—13¾	..	5 16 5
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50*	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	+2	4 0 0
209,984	,,	,,	10	Do. B	248—250	+2	4 0 0
523,500	,,	,,	10	Do. C	248—250	+2	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85—87	..	3 9 0
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	156—158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	Nov. 14	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Aug. 30	6½	Tottenham and Edmonton } A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	B 3½ p.c.	104—106	..	4 14 4
137,500	,,	Dec. 28	4	4 p.c. Deb.	101—103*	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10⅜—11*	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104*	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands-worth and Putney } A 5 p.c.	—	..	—
255,636	,,	,,	6½	B 3½ p.c.	140—145	..	4 9 8
75,000	,,	,,	5⅛	C 3½ p.c.	113—115	..	4 17 6
79,416	,,	Dec. 8	3	3 p.c. Deb. Stk	79—82*	..	3 13 2
779,875	,,	Aug 15	5⅛	West Ham 5 p.c. Ord.	103—105	+1	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	101—104*	..	3 16 11

Prices marked * are "Ex div."

information is to be welcomed, as pointing the way to the avoidance of similar occurrences in future.

The authorities in Dundee are engaged in the work of arranging for the better conducting of the traffic in the harbour. To this end an agreement has been entered into between the Harbour Board and the Railway Companies, to which legislative sanction is being asked. The subject was brought before the Town Council on Thursday by Bailie Melville, who pointed out that under the agreement not more than 1000 tons of coke could be carried in any one year from the gas-works to the harbour, and said that the proposal should be opposed, with the object of forcing the Railway Companies to allow any quantity of coke to be carried. The fact was, he asserted, that the Railway Companies did not want more than 1000 tons carried per year, because the remainder would have to be taken to Methil; and for this the Railway Companies would charge 2s. 6d. per ton. He had before tried very hard to have the present arrangement altered; but the Railway Companies would not budge. The Council agreed to adopt means to have the agreement opposed. The chief irony of the situation lies in the fact that the gas-works are so close to the harbour that there is only the breadth of a thoroughfare and a railway between them.

On the afternoon of Saturday last, Andrew Breckenridge, 18 years of age, residing in Irvine, was conducting experiments in an outhouse with acetylene gas, when a violent explosion took place. The young man sustained a fracture of the skull; and a good deal of damage was done to the building.

Yesterday the Directors of the St. Andrews Gas Company appointed Mr. Robert Hall to succeed his late father in the managership of the Company. The appointment must have been of the nature of a formality, for Mr. Hall has been for several years Joint Manager; but it is well, with appointments, that formalities should not be omitted.

It is well known that not much progress can be made with the Government scheme for the establishment of a Naval base at Rosyth, in the Firth of Forth, till an adequate water supply is brought in. For the provision of this, there is an agreement between the Admiralty and the Dunfermline District Committee of the Fife County Council. A scheme has been agreed upon, which includes the construction of a mutual reservoir at a place called Glenquey. The construction of the dam of this reservoir, it would seem, is causing some trouble. Yesterday, at a meeting of the District Committee, Mr. D. Alexander, the Chairman, said it was with the greatest regret that he laid before them the very disappointing state of matters at Glenquey. As they were aware, considerable difficulty had been experienced in obtaining a satisfactory foundation for the whole of the puddle trench. A large portion of the trench had been excavated and filled up with puddle; but there still remained a space of about 200 feet in length to be dealt with. In August last, there were good hopes that they would obtain a foundation at 112 feet down; but it was resolved to test the 200 feet space by means of bores. This was done; and it had been reported that a good foundation had been secured at 200 feet down. The Chairman sincerely hoped that they had come to the end of their troubles; and though the cost would be increased by the greater quantity requiring to be excavated, he trusted it would be accomplished without any great difficulty. Unfortunately, a large quantity of the material to be excavated consisted of sand and gravel, which was full of water; and it would require to be drained. They must not look forward to having water for eighteen months or two years. The Contractors—Messrs. James Young, Limited—are desirous of having their contract revised; and a Committee was appointed to negotiate with them upon the subject.

The severe weather of the past week has left its trail behind it in the shape of burst water-pipes, to a greater extent than is usually experienced. In Aberdeen the situation has been exceedingly trying; it being estimated that 1000 burst pipes have had to be dealt with.

In Paisley, on Monday, a serious burst took place in a 36-inch water-main upon the north side of High Street. Part of the roadway was torn up; and the water rushed in large volumes down High Street and adjoining thoroughfares, flooding a number of shops and houses. The repair of the pipe interfered with the tramway traffic, which had, for a time, to be conducted upon a single line.

Heavy Sentence on a Slot-Meter Robber.—At the Blackburn Quarter Sessions last Friday, James Bolton, 44, a factory operative, was found guilty of stealing sums of 1s. 6d. and 3s. 2d. from prepayment gas-meters in dwelling-houses. The accused was caught with a steel drill and 36 pennies in his pocket. Many convictions having been proved against the prisoner, the Recorder sentenced him to four years' penal servitude, observing that he was a dangerous criminal.

Gas Explosion in Hereford.—Miss Lizzie Turner, of 59, Catherine Street, Hereford, and a little girl nine years old, the daughter of a neighbour, were sitting at the fireside in the afternoon of the 29th ult., when there was a loud report in the room, followed by an upheaval of the floor, the furniture and crockery, &c., being damaged. The next moment flames broke out, and the occupants of the room made their escape. The fire brigade were promptly on the scene, and soon extinguished the fire. It appears that a gas-main in the street became fractured, and the escaping gas, owing to the frozen state of the ground, could not find an outlet except underneath the flooring of the room. The house was supplied on the prepayment system.

Birmingham Free from Naphthalene Trouble.—In the report to be presented by the Gas Committee at the next meeting of the Birmingham City Council, they refer to the naphthalene question. In their report of May 22 last, they drew attention to the difficulties and loss occasioned by the deposit of naphthalene in the mains and service-pipes, and outlined the steps it was proposed to take to overcome the difficulty. They now report that, so far, their efforts have been successful; the number of cases of defective supplies of gas from the cause stated having been reduced from 23,520 in 1905 to 519 during the past year—a result which they consider bears testimony to the efficacy of the method adopted for dealing with this serious nuisance.

Reminder

1907.

Richmond's always Up-to-date!

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

CURRENT SALES OF GAS PRODUCTS.

Week ending Jan. 5.

The London market for tar products has been rather quiet, which was to be expected at this season of the year. Pitch is, however, steady, and deliveries are being readily taken up; while suggestion to anticipate delivery in most cases has had to be declined by makers. Ordinary London creosote oil is in good demand; and it is reported that 12s. net per barrel has been paid for prompt shipment. Benzol and the other light products remain in a strong position. Sulphate of ammonia is still a neglected article.

Sulphate of Ammonia. LIVERPOOL, *Jan.* 5.

The year has opened very quietly; there being less anxiety on the part of makers to effect sales, while buyers remain indifferent. Consequently the week's business has been limited; quotations being £11 12s. 6d. per ton f.o.b. Hull, £11 13s. 9d. to £11 15s. per ton f.o.b. Liverpool, and £11 16s. 3d. per ton f.o.b. Leith. There has been large direct inquiry for January, February, and March shipment; the idea being to get in at something near the level of spot prices. But makers seem inclined to take their chance of doing better later on; and consequently not much actual business has been done.

Nitrate of Soda.

Although there is not very much doing, the tone of the market is firm, and spot prices remain 11s. 3d. and 11s. 6d. per cwt. for ordinary and refined qualities respectively.

Tar Products. LONDON, *Jan.* 5.

There has been very little change in the market during the past week. Pitch remains quiet, and there seems even less indication to buy for January-June than was the case last week. Business has been done in London at 25s., and it might still be possible to place some further quantity at this price; while on the east coast some pitch has been sold at 24s. 6d. for January-March, and offers to sell at 25s. Goole for January-June have been refused. At ports on the west coast, the value may be taken as from 24s. to 24s. 6d.; while a very fine make was offered from now to the end of June at 25s. without success. There is an absence of demand from the Continent, though consumers would probably consider business over next season, but only at very low figures. Creosote continues firm. A large business is spoken of in the North at 2d. at makers' works; and this price was accepted by a London manufacturer who was pressed to clear out some quantity, though the actual value of London oil may be taken as 2⅛d. In the Midlands, a little business is spoken of at from 2 1/16d. to 2⅛d., but there is very little offering; while in Liverpool and Manchester prices vary from 2d. to 2⅛d. In carbolic acid, Continental consumers maintain their limit of 1s. 8½d. for 60's; but it is impossible to buy at this price in England, where dealers appear willing to pay 1s. 8¾d. on the east coast over the next five or six months. In crystals, the position remains about the same, and prices are well maintained. Solvent naphtha keeps its position, and is selling freely in the Manchester district at from 1s. 2d. to 1s. 2½d. On the east coast 1s. 3d. is asked; while in London 1s. 5d. has been obtained for prompt delivery, and very good prices are spoken of for 95 per cent., which is scarce. Toluol, ordinary 90 per cent., is quiet; but the demand for pure continues, though there is no alteration in price. Benzol is scarce, and 1s. 1d. has been paid in London, and even 1s. 1½d. for a small quantity for prompt delivery. In the North, consumers talk of purchases at under market value; but these have not been confirmed. 50-90 is not in quite such good demand; but prices have not changed.

The average values during the week were: Tar, 14s. to 18s. Pitch, London, 25s. to 25s. 3d.; east coast, 24s. 3d. to 24s. 6d.; west coast, 24s. to 25s. Benzol, 90 per cent., 1s. to 1s. 1d.; 50-90 per cent., 11½d. to 1s. 0⅝d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5¼d.; solvent naphtha, 1s. 3d. to 1s. 5d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2d. to 2⅛d.; North, 1⅞d. to 2d. Heavy oils, 2⅛d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 8¾d. to 1s. 9d. Naphthalene, £4 10s. to £9 10s.; salts, 33s. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market is very quiet. Business has again been done in a London make at equal to £11 10s. on Beckton terms; but the principal Gas Companies have not reduced their quotation of £12 5s., and are not anxious to sell. In Hull, £11 15s. was paid for one of the best makes; but ordinary qualities are not worth more than £11 12s. 6d. In Liverpool, the prompt value is from £11 13s. 9d. to £11 15s., but considerably higher prices are offered forward, though no business has been arranged. In Leith, there is very little doing; but the value may be reckoned as from £11 17s. 6d. to £12.

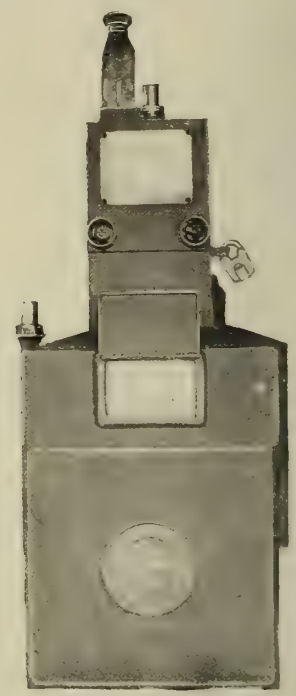
Accidental Poisoning by Coal Gas.—At Hammersmith, a few days ago, an inquest was held by Dr. Luxmoore Drew upon Alfred Edward Harvey, aged 32, a commercial traveller. The evidence showed that deceased and his wife spent Christmas Day at his mother-in-law's house, and he was then in excellent spirits. About mid-day on Boxing Day he went home to change his clothes, as he purposed attending a football match. He had promised to return to his mother-in-law's house later in the day, but he did not do so. His wife, however, was not anxious as to his whereabouts. On Thurday morning her brother went to the deceased's house, but could not get any reply to his knocking. His wife then went home, and entering the kitchen with her sister, saw her husband's clothes there. Going into the bed-room, where there was an overpowering smell of gas, she found her husband unconscious upon the bed. He died on Saturday morning. In the bed-room was a sliding chandelier, none of the taps of which were turned on; but gas was found to be issuing from it. Death was attributed to poisoning by coal gas. It was stated that deceased had no troubles of any kind. The Jury returned a verdict of "Death by misadventure."

ALWAYS FIRST

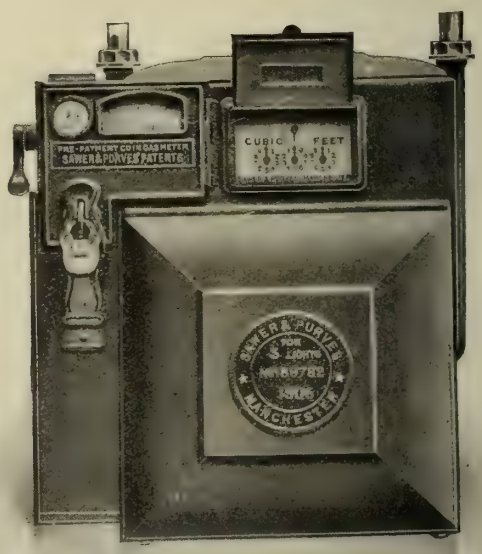
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Prepayment Meter.



FIRST IN 1889.



FOREMOST 1906.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The rise in the prices of coal in the Lancashire and neighbouring districts, as announced in this column last week, came into force on New Year's Day. Added to trade demands, came a spell of severe weather to enforce dealings in house requirements. Considerable delays in the returns of "empties" have been, and are being, experienced. It has been found difficult to get the coal away from the pits. Miners' holidays have been shortened as much as possible, owing to the impetus in the coal trade. Average quotations in the Lancashire district are: Best house coal 14s. to 15s. per ton, secondary 13s. to 14s., common 9s. 6d. to 10s. 6d., burgy 8s. to 9s., best slack 7s. 3d. to 7s. 9d., medium 7s., common 6s. to 7s., coal for shipping and export 10s. to 11s. Coke is in good request, and dearer. In districts outside the Manchester area, prices have been increased from 5d. to 10d., and even 1s., per ton for best house qualities. Gas coal and cannel are dearer. The general demand for coal of all kinds has compelled colliery proprietors to take from stocks.

Northern Coal Trade.

There is now nearly a full output of coal; and this has had the result of giving a slight ease to the prices in some cases. It must, however, be added that there is a large amount of the coal sold for the next few weeks; and thus any additional demand would influence the values. In the steam coal trade, best Northumbrian kinds are from about 12s. 6d. per ton f.o.b., second-class steams 11s. 6d., and steam smalls from 7s. to 8s., with the possibility of some change as the output becomes normal. At the same time, it must be remembered that the export is heavier than is usual at this season of the year. As to gas coals, the demand is still a very large one, and it shows no sign of slackening for a month or so to come. Good Durham gas coals vary from about 10s. 3d. to 11s. 6d. per ton f.o.b.; and the very best sorts are quoted as much as 1s. per ton higher. Stocks of gas coals have been evidently reduced during the holidays; and there is some pressure in the requests. The tenders have now been sent in for the contracts, for about 175,000 tons of gas coal, for Copenhagen; and it is probable that the decision will be soon made—though higher prices seem to be certain. There is a strong inquiry for coke, which stimulates gas coke. Good gas coke is quoted at 13s. 6d. per ton f.o.b. in the Tyne, and the demand seems good at present.

Scotch Coal Trade.

The Glasgow Coal Exchange is kept closed in the first week of the year, so there is no record of business. From the Lothians, there comes information that colliery owners have resolved to advance the price of coal. Among the prices given are: Jewel, double screened, 13s. per ton, jewel chirls, 11s. 9d., steam coal, 9s., treble nuts, washed, 10s., double nuts, washed, 9s., single nuts, washed, 8s., and pearls, washed, 6s. The shipments for the week amounted to 255,876 tons—a decrease of 36,745 tons upon the preceding week, and of 50,606 tons upon the corresponding week of last year. The decrease was most pronounced in the East of Scotland, where the exceptionally stormy weather interfered with shipping. For the whole of 1906, the shipments of coal amounted to 13,900,397 tons—an increase of 1,531,769 tons upon 1905.

Unsatisfactory Electric Lighting at Pontypool.

Pontypool Market is, it appears, lighted by electricity; but the erratic nature of the service has led to complaint being made more than once at the meetings of the Urban District Council. Calling attention on the last occasion to the matter, one member said that so far the lighting of the building with electricity had been very unsatisfactory. The lights went out on a recent Saturday for twenty minutes at a time; and the stallholders were clamouring loudly in favour of gas. The loss of these unfortunate people does not on such occasions end with the light, for "when the lights were out," we are told, "goods were pilfered from the stalls." Another member considered that they could not afford to play with the matter of light year after year. It was a considerable source of annoyance. The Gas Company had offered to light the market for £30 a year; while the electric light cost double this amount. On the other side, it was remarked that there had been trouble with the gas also. The gas of Pontypool was not by any means a perfect light. In the end, one of the members gave notice that at the next meeting of the Markets Committee he would move that, subject to the electric light being still unsatisfactory, gas be installed in the market.

Coventry Gas-Fitters and the Corporation.—At the meeting of the Coventry City Council last Tuesday, the minutes presented by the Gas Committee contained the resolution come to by the Committee not to make any alteration in the present practice with regard to the supply of fittings by the Gas Department, to which reference was made in the "JOURNAL" last week (p. 51). In answer to an inquiry by Mr. Gardner as to the reasons for the Committee continuing their policy of putting in private fittings and doing similar work, the Chairman of the Committee (Mr. Batchelor) replied that the question had been discussed by a fairly full Committee, and they were unanimous in their decision not to reopen the subject. They did not want small work; but they found it advisable, when people were erecting property, to get them to allow the Gas Department to put in the gas-fittings, as they found that in several cases the work had been done in a most unsatisfactory manner, and many complaints had been received as to bad gas which were really due to this cause. Unless the class of work to which Mr. Gardner referred could be brought under proper supervision and inspection, it would continue to be a source of complaint. At present the Committee had no powers of supervision, to see that the work was done rightly; so they thought it was advisable to get it done themselves, and thus save many of the complaints they received. The minutes were confirmed with a few dissentients.

RADIATOR PICTURES, No. 12.



Another Town Hall in which

WRIGHT'S "ST. ANDREW"

Gas-Heated Steam Radiators

have been installed.

Wrights
The
Radiator
People.

Failures of the Electric Light.

Last Friday afternoon, at about five o'clock, there was another failure of the electric light in Marylebone—the locality principally affected being Oxford Street. The public lamps were the first to give out; and the shop lights very soon followed their example. The crowded thoroughfare was lighted only by feeble cab lamps and the brighter beams of the acetylene gas lamps in the motor omnibuses. Inside the shops confusion reigned for some minutes. It being the "sale" season, the counters were crowded; and when the light failed there were excited stampedes to the doors. Candles and other illuminants were promptly requisitioned until the supply of current could be restored. On Monday last week there was a failure of the electric light at the Queen's Theatre, Manchester; and another next day in the dining hall under the Royal Exchange.

Water Supply of Alfreton.

The Water Committee reported to the last meeting of the Alfreton Urban District Council that they had considered the question of obtaining a supplementary supply of water from the South Wingfield Colliery, but they recommended that no steps should be taken with regard to it until the Council had received terms for a proposed supply from the Basford Rural District Council or some other body. Mr. Johnson, the Chairman of the Committee, moved an amendment to the adoption of the minutes, because he had heard no real objection to the acquirement of the water, which, he said, was good, and when filtered and mixed with their own would be perfectly satisfactory. The colliery owners offered the water at 2d. per 1000 gallons; and assuming that the total outlay would be 4d. per 1000 gallons, he estimated it would cost the Council about £390 a year. The cost of pumping the water now was about £346; and he was of opinion that the pumping would be obviated if the additional supply were taken. The proposal was to lay mains and put down a filter, which he estimated would cost £2000. The water would be filtered and pumped into the mains by the Colliery Company. The County Analyst said the water, treated as he had suggested, would be satisfactory; and so there was no reason to delay further. Upon a vote being taken, equal numbers were recorded on each side. The Chairman (Mr. G. Preston) thereupon gave his casting-vote in favour of the adoption of the minutes.

The Charge for Water in London.

According to letters which have lately appeared in "The Times," dissatisfaction exists, both in the City and at the West-end, on account of the increased charges made by the Metropolitan Water Board under the last quinquennial valuation. In the issue for the 29th ult., a City firm wrote to the effect that when supplied by the New River Company their rate was £9 2s. per annum; but that it had been raised to £14 19s. 2d.—an amount based on the present rateable value of the premises. The firm in question remonstrated, and pointed out that while the New River Company had the same powers as the Board, they did not exercise them; and they said their idea was that under the new authority the charge would be less rather than more. In reply, the Board admitted that they did not possess any greater powers than those enjoyed by the Company named, but said they were in an entirely different position, as regards the consumer, from that occupied by an undertaking "trading for profit." The firm closed their letter by expressing the opinion that if the Company could make a profit on the amount they charged, the Board must be doing exceedingly well. Writing on the same subject last Wednesday, a firm of auctioneers in New Bond Street said the Board wished to increase their rate, though, under the Grand Junction Water Company, an arrangement had been come to that it should never be raised while the occupation of the premises remained unchanged. They said the water used by them in a year was not equal to a month's consumption in a house let at £50 per annum. They, too, thought that the idea of the amalgamation of the various Water Companies under one head was to save expense and for the public benefit, by giving them water at a reduced rate; but it seemed to be the reverse.

The Quality of Coventry Gas.

The above subject was discussed by the Coventry City Council at their meeting last Tuesday, when Mr. Rainbow called attention to a report of the Gas Examiner, in which he stated that the illuminating power for the last four weeks had been only 15·80 candles—a result which was rather below the usual standard. The Chairman of the Gas Committee (Mr. Batchelor) stated in reply that the gas was certainly 2 candles below the usual power, but that it was still above the standard they were supposed to maintain. The Engineer (Mr. F. W. Stevenson) thought the variation was possibly due to the gas staying in the pipes too long, which possibly affected the test, and that this had not been continued sufficiently long to yield a proper result. It was certainly not a reliable test, as it varied very much from that made at the gas-works. There was no reason why one should not be the same as the other; and, under proper conditions, the gas would show an illuminating power above the standard. Alderman Maycock said the sulphur in the gas was far above what they were told it would be, and was very objectionable in sitting-rooms. Mr. Batchelor said he was afraid the sulphur was a little bit of a bogey. London had got Parliament to sanction the abolition of the sulphur test, and other towns, supplied by companies, had recently obtained an Act freeing them from the sulphur restrictions. If Parliament had not been thoroughly satisfied, it would not have allowed the Act to go through. He thought that instead of a test for sulphur they might have one in Coventry for calorific power. It would be extremely useful. With the incandescent light, and the quantity of gas used for brazing and enamelling, and also for driving engines, it was absolutely necessary that the calorific power should be maintained; and a test for it would be very useful to manufacturers and everybody.

PARKINSON'S GAS-FIRES.

NEW DESIGNS 1906-7.



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ADJUSTABLE GAS AND AIR REGULATOR.

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Fatal Acetylene Explosion.—An explosion in connection with a private acetylene gas lighting installation at Navan has caused the death of a plumber and severe injuries to two labourers. The frost had put the apparatus out of order; and the men were endeavouring to set matters right when the accident occurred.

Opposition to the Birkenhead Water Bill.—The Chester Town Council have resolved to oppose the Bill which the Birkenhead Corporation are promoting to enable them to obtain a supply of water from the Rivers Alwyn and Brenig, in Denbighshire. It was argued that the scheme would affect the interests of the city and county borough of Chester.

Fatal Gas Suffocation Case.—Last Tuesday, in their bedrooms over a small confectioner's shop at South Norwood, Helena Perks and her niece Maud Sturgess were found dead, with the place full of gas. Among the fittings in the shop below, a serious leakage was found; and this was the cause of the tragedy—the doctor who was called stating that both had succumbed to gas poisoning.

Companies Wound Up Last Year.—Among the Companies wound up voluntarily last year were the West Suburban Gaslight and Coke Company and the Guernsey Water-Works Company—the latter with the view to continued existence in another form. The following were wound up by order of the Court: The New Export Incandescent Lighting Company, the Acetylene Gas (Automatic Generator) Syndicate, and the St. Neots Water Company.

Suicide by Gas in a Prison Cell.—Frederick G. Dennis, who was serving a short term of imprisonment in Northampton Gaol, blew out the gas in his cell, and after placing a pillow-case over his head, fastened the opening to the gas-bracket, and so suffocated himself. Until a few days previously, he had been confined in a cell lighted from the outside; but he complained of cold, and his request for a warmer cell was granted. At the inquest, the Coroner commented on the danger of leaving in prison cells gas-brackets which gave a man inclined to suicide a ready means of achieving his object. A verdict of *Felo de se* was returned.

West's Regenerator Settings for Japan.—A contract has been placed with West's Gas Improvement Company, Limited, for the retort-benches which are being erected in a new retort-house at the works of the Osaka Gas Company in Japan. The contract comprises the whole of the materials in the main arches, regenerator settings (nine retorts, 20 feet long), and all the mouthpieces, retort-bench fittings, chimneys, &c. Superintendence of the erection of the work is also included in the contract. The same firm have during the last ten years supplied several complete installations of inclined retorts and coal-handling machinery to Tokio and Yokohama.

Appleby Water Supply.—At an inquiry held by Mr. A. A. G. Malet, on behalf of the Local Government Board, into certain applications made to the Board by the Appleby Corporation, one of which was to borrow £1200 for the purpose of improving the water supply, evidence was given to the effect that the scheme, according to Mr. Baldwin Latham's plans, was to construct a puddle wall round the springs at the head works to intercept impurities, and the construction of a covered reservoir to hold 60,000 gallons. It was stated that there had been great waste, and as the existing loans would be discharged during the next financial year, it was deemed advisable to do the work as soon as possible. No opposition was offered to the application.

Price of Gas at Dewsbury.—The Dewsbury Tradesmen's Association appealed to the Gas and Electricity Committee for a reduction in the price of gas for lighting purposes; but the Committee replied that they were unable to comply with the request. When the matter came before the Town Council, however, there was a long discussion, in the course of which it was stated that the price of gas was 3s. per 1000 cubic feet, and for ten or a dozen years the proposed reduction had been discussed in the Council. The price in Dewsbury was, it was maintained, higher than that charged by almost every other corporation in England. There was a nearly unanimous opinion in favour of reducing the price charged for lighting purposes; and the Committee's minute was referred to the General Purposes Committee for further consideration.

Water Purchase at Ashington.—In consequence of the Bill which the Tynemouth Corporation are promoting for powers to extend their area of supply, the Ashington Urban District Council have agreed to take water in bulk from the Ashington Colliery Company, as they came to the conclusion that it would be much cheaper to take the existing supply from the pit than to embark upon a scheme for bringing the Tynemouth water into the district. The Council have agreed to pay the Colliery Company 7d. per 1000 gallons for the water, together with £150 annually for the use of their main. The Council have to maintain, renew, and extend the mains at their own expense as necessity arises. Hitherto the miners have been supplied with their water free of charge by the Colliery Company. It is estimated that the district will require nearly 100,000 gallons of water per day; and a water-rate will be levied.

No Free Gas-Stoves at Middleton.—At the meeting of the Middleton Town Council last Wednesday, Mr. Parker, in moving the minutes of the Gas Committee, said they had considered the report of the Gas Manager (Mr. J. C. Moon) with respect to the charges for stove and meter hire, and had decided to defer the question until after the end of the current financial year. He might say that the Committee had considered the question of free cookers, and had come to the conclusion that they could not give cookers free to consumers of gas in the borough, as it would mean the sale of a great deal more gas to those who used them than they could supply from the present works. Alderman Bentley said he should like a report to be supplied to the Council showing the number of houses fitted with two meters, what was the gross revenue from this source, and what was the capital account. He thought the same price should be charged for gas for both cooking and lighting purposes. He should also like to know what was the revenue from the ordinary and the slot meters. He hoped these matters would hav the attention of the Committee.

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Twenty beautiful shades to choose from.

Will never tarnish.

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Moderate in Price.

R. & A. MAIN, LIMITED.

LONDON and GLASGOW.

The Pontypridd Urban District Council have appointed Mr. G. R. Strachan, M.Inst.C.E., to report upon the quality of the water supply, at a fee of fifty guineas.

At their meeting last Thursday, the Hull and District Chamber of Trades passed a resolution to the effect that it was not desirable for the Corporation to purchase the undertaking of the East Hull Gas Company.

According to the correspondent of the "New York World" at Scranton (Penn.), typhoid germs have been discovered in the reservoirs which supply the town with water. There are 930 cases of illness which are attributed to bad water.

Richmond's gas-steam radiators have during the last few days been installed for the heating of St. Matthew's Church, Ponders End, the Baptist Chapel, Bayswater, and Percy Road Chapel, Kilburn. The Co-operative Printing Society have also had twenty of the radiators for heating their Tudor Street premises.

On Friday, the 28th ult., the principal members of the works staff of John Wright and Eagle Range, Limited, had their annual supper, followed by a smoking concert, at the Acorn Hotel, Birmingham. In the course of the proceedings, the Works Manager proposed a toast thanking the firm for the manner in which they had contributed towards the entertainment; and it was cordially received. A programme of music was gone through which added very considerably to the enjoyment of the evening.

The Cannon Iron Foundries, Limited, of Deepfields, near Bilston, have sent one of their latest catalogues (No. 245) of gas goods. It consists of about 150 quarto pages (8½ in. by 11 in.), and presents an excellent collection of cooking and heating stoves, grillers, hot plates, meters, and accessories. Attention may be specially called to the "Iris" stove, illustrated on p. 120, which is so arranged as to allow of the removal of the burner without disconnecting the fire; also to the "Victory," on p. 110, which embodies a new departure in the construction of these appliances, whereby, it is claimed, the radiating power is considerably increased. These two stoves occupied the first and third places in the list of the eight best stoves selected by the Smoke Abatement Society. The illustrations of the goods are preceded by some remarks on "Porceliron," the material largely employed by the Company in the construction of their stoves, and an epitome of the history of the undertaking. The catalogue is well printed, and bound in an artistic style.

The Newark Urban District Council have arranged with the Gas Company for the fitting up of 41 public lamps with incandescent burners. The charge for upkeep, &c., is to be 1s. 6d. each per annum.

The Rochdale Gas Committee propose to increase the insurance on the gas-works by the sum of £3500—£1000 on the offices, governor-house, and workshop, £1000 on the contents of these buildings, £1000 on the meter-shop, stores, and lavatories, and £500 on their contents. They also recommend that inquiries be made with reference to the insurance of the tar-works.

We have received a copy of a large sheet of extracts from newspapers, compiled and edited by Mr. T. G. Marsh, of Manchester, in support of his advocacy of the supply of cheaper gas for fuel. In most cases the extracts are followed by some pithy comments by Mr. Marsh, which are printed in red ink to catch the eye. The heading of the sheet is "The Desire: Cheaper Gas for Fuel;" and the motto is "Security is Mortal's Chiefest Enemy."

In the "JOURNAL" for Nov. 13 last, we gave an illustration of the Parish Church at Ross, Herefordshire, as lighted by Bland inverted incandescent burners. It will be of interest to supplement the particulars accompanying the picture by a few figures as to the cost of the lighting. Writing to Messrs. Bland and Co. a few days ago, the Churchwarden (Mr. W. Watson) said the success of their burner exceeded his expectations. In the quarter ending Christmas, 1905, with naked burners, the consumption of gas was 65,200 cubic feet; whereas in the corresponding quarter last year, with Bland burners, it was only 31,800 cubic feet—being a saving of 33,400 cubic feet, of the value of £6 13s. 7d. Mr. Watson added that during the whole of the quarter they had not renewed a single mantle or globe.

Of the many ways of comparing electricity with gas which have come before us, we have not seen one much more simple or more striking than that adopted by Mr. James Paterson, the Engineer and Manager of the Redhill Gas Company, in a leaflet he is circulating. On the left-hand page, he shows in bold type that a light of 16-candle power furnished by an incandescent electric lamp for 16 hours costs 5d., with current at 7d. and 4d. per unit, or a flat-rate of 5d.; whereas, as shown on the opposite page, five times this quantity of light, or 80 candles, can be obtained for the same time at half the cost from gas sold at 3s. 4d. per 1000 cubic feet, if burnt with an incandescent mantle. The consumers in his district will do well to follow the advice given at the head of the leaflet, and "Look at this."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Oswestry Gaslight and Coke Company. Applications by Jan. 12.
DRAUGHTSMAN. No. 4687.
DRAUGHTSMEN. No. 4688.
GENERAL FOREMAN. No. 4691.
SUNDRIES AND STORES CLERK. No. 4690.
RENTAL CLERK. No. 4692.

Situation Wanted.

BOOK-KEEPER, SHORTHAND WRITER, AND TYPIST No. 4686.

Agencies Wanted by London Firm. "H." Tallis Press, London.

Gas-Works for Sale. No. 4689.

Plant, &c., for Sale.

COMPLETE GAS-WORKS PLANT AND APPLIANCES (NEW STREET GAS-WORKS, EDINBURGH). Edinburgh and Leith Gas Commissioners.
GAS ENGINE (50 H.P.), &c. "G. S.," West End Advertising Agency.

Stocks and Shares.

CHIGWELL, LOUGHTON, &c., GAS COMPANY. Jan. 15.

TENDERS FOR

Fire-Clay Goods.

BURY GAS DEPARTMENT. Tenders by Jan. 19.
HEYWOOD GAS DEPARTMENT. Tenders by Jan. 15.
ROTHERHAM GAS DEPARTMENT. Tenders by Jan. 22.

Gasholder.

NEW MALLOW GAS COMPANY. Tenders by Jan. 21.

Mantles, Protectors, &c.

PLYMOUTH LIGHTING DEPARTMENT. Tenders by Jan. 31.

Retort-Bench Brickwork.

BURY GAS DEPARTMENT. Tenders by Jan. 22.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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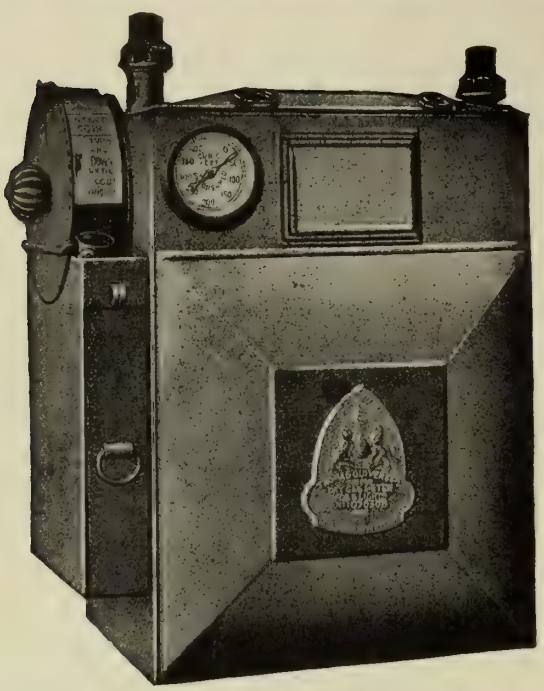
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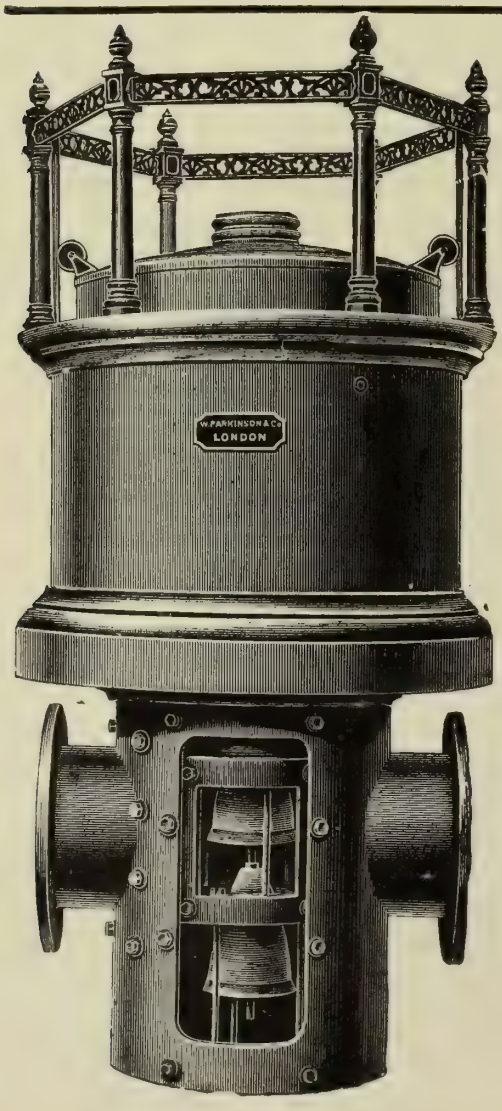
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EDITORIAL NOTES—GAS, &c.

A Tardy Conversion.

POLITICALLY, Scotland has long declared itself seriously radical, but in relation to its gas supply, seriously conservative. We cannot refrain from a little musing on the latter state after looking into the Provisional Orders that the Corporations of Glasgow and Aberdeen have introduced, for the coming session, under the Private Legislation Procedure (Scotland) Act, 1899; and we are hoping these two Orders are destined to be valuably operative in breaking down the conventional high illuminating power of gas across the Border. When the matter is thoroughly inquired into, and the defence of the intemperance that has existed in relation to gas illuminating powers in Scotland is weighed, it is easy to perceive that underlying it is, to a large extent, pure fancy with a no more substantial base-work than custom. It is a case of custom mocking the mutability that invests use with more scientific conditions. The rich coal supply best available to some of the Scotch undertakings owing to their geographical situation has admittedly much to do with the higher illuminating powers than obtain in England; but the excessive richness in many cases, and the bolstering up of illuminating powers that goes on, indicate in what a considerable measure tradition is held superior to the practical considerations of the present day. The composite character of the human mind is a matter that we cannot stop to inquire into here; but the thought passes that, while high illuminating powers are traditional in the Scotch gas industry, so are economy and thrift among our kinsfolk generally in Scotland. In the present day, when richness in gas supply is repugnant to economy, having regard to the methods of use, we cannot reconcile their traditional high illuminating power with traditional economy and thrift; and what is more we do not intend to attempt such an insuperable and thankless task.

Mr. William Foulis, his successor, Mr. Alexander Wilson, Mr. W. R. Herring, and others have proclaimed the correctness of the doctrine of lower illuminating powers for Scotland as elsewhere, and have supported it by example in the case of Glasgow, and have endeavoured to produce in Edinburgh the condition that would give a like support. Perth many months ago adopted for the testing of its gas the new Metropolitan argand burner No. 2; Glasgow in its present Order are doing the same; and Aberdeen are asking for a similar right. Glasgow has the power to supply 16-candle gas, and is now supplying 18 candles tested after the same manner—by a flat-flame burner—that obtained some 38 years ago when the Corporation acquired the works. With the gas properly treated, the change should result in economy. The Aberdeen Corporation, whose prescribed illuminating power is 20 candles, are making preparations for supplying down to 15-candle gas, if circumstances demand or are propitious; and they are also, as mentioned above, taking power to use the Metropolitan No. 2 burner, which is well suited for all gas up to 20-candle power. At the present time the Corporation are, we believe, distributing somewhere about a 22-candle gas tested, not as it was three or four years ago by an iron union-jet burner, but by a Bray steatite topped burner. By this simple change in the manufacturing practice of Mr. Samuel Milne at the Aberdeen Gas-Works, there has been an economy effected which is represented by 2 candles. But in the Aberdeen Order, there is a provision that so long as the gas supplied by the Corporation with respect to its illuminating power is more than 20 candles, the burner to be used shall still be the union-jet. There ought not to be in Aberdeen any occasion to require to supply a gas of higher illuminating power than 20 candles tested by the Metropolitan No. 2 burner, even allowing liberally for Mr. Milne's profession at the last North British meeting that he is not a defender of low-quality gas. However, these proposals in the Provisional Orders of Aberdeen and Glasgow—to relegate to the ranks of things that have been the old-fashioned unscientific method of testing gas, which gives to it an erroneous and incomparable value, and in the case of Aberdeen to provide the right to supply an all-round useful gas of reasonable illuminating power—are movements that cannot be disregarded in connection with this tardy conversion, when taking account of the trend of events.

In the opening paragraph, custom was accused of being the cause of the retention of high illuminating powers more than necessity and economy. It may come as a surprise to many gas engineers to learn that though the illuminating powers supplied in Scotland range between 18·5 and 29 candles, there are at present only two authorized gas undertakings supplying under 20-candle power gas, and there are only eleven out of fifty authorized gas undertakings which have a prescribed illuminating power of 20 candles or upwards. Actually out of the fifty authorized concerns, 27 have an illuminating power prescribed of 14 candles; and the gas supplied by them severally is at a figure between 20 and 29 candles. Five concerns have a prescribed illuminating power of 15 candles; four of 16 candles; two of 18 candles; nine of 20 candles; one of 21 candles; one of 22 candles; and one fortunate undertaking—Renfrew—has no prescribed illuminating power at all, but 24-candle gas is distributed. The absurdity of this veneration of high and wasteful illuminating powers is emphasized when it is found from the last-issued Board of Trade returns that, in the twelve months covered by them, in Scotland alone 274,381 gallons of benzol and 4156 tons of gas oil were used by sixteen undertakings out of fifty to fatten the gas sent out. However it may be hoped that—incandescent gas-burners, gas fires, stoves, and gas-engines being the most approved channels of utilization for gas—we are now at the dawn of changed opinion and policy in Scotland, when a common-sense gas meet for all purposes will take the place of gas of an inflated richness, which is a mistake in the economics of both production and service. One good feature of the outlook is that the majority of the undertakings have no statutory responsibility in regard to illuminating power beyond the common standards applying in England.

Provisional Orders—A Point in Gas Testing.

IN addition to the applications to the Secretary for Scotland, the principal feature of which is noticed in the preceding article, there are only half-a-dozen Gas Provisional Orders introduced for the consideration of the Board of Trade. But, speaking generally, they are not very noteworthy; their main object being additional money powers, which, of course, is a good index of the prosperity of these smaller concerns. It is observed that the applicants are exactly divided in asking for borrowing powers equal to one-fourth and one-third of their issued capital. There seems to be no reason why they should not all enjoy the increased liberty of the one-third proportion, instead of the one-fourth that was the rule in former days. The Seaford Gas Company are proposing to put themselves under the 10 and 15 per cent. restriction as to discounts—a course for which we cannot now find any rational explanation. There is also a purchase clause in this Company's Order, operative for five years, in favour of the District Council.

In regard to illuminating power and testing, the smaller Gas Companies are falling into line in adopting modern conditions. The Seaford Company are suggesting 14-candle gas, tested in accordance with the new model clause. Then, following certain precedents of last session, the Twyford (Berks) Company are contemplating a 13-candle standard, tested by the Metropolitan argand burner No. 2 with a 6-inch by 1⅝-inch chimney; and, "if at any time the gas-flame "tails over the top of the glass, a 6-inch by 2-inch chimney "shall be used." The quoted provision is rather a singular one in association with the Metropolitan argand burner No. 2;

and we rather suspect that the idea of the second chimney has been merely lifted from the old London argand clauses by the draughtsman of the Twyford Order, who was not aware that it was now unusual. The Departmental Committee of the Board of Trade distinctly recommended a fixed diameter of chimney with all qualities of gas; and the Metropolitan Gas Referees, conforming to the recommendation (as is easily possible with the now common illuminating power standards and the Carpenter burner), only prescribe the one chimney of $1\frac{5}{8}$ inches internal diameter. On the other hand, the 2-inch chimney may have been proposed in the Twyford Order under a misapprehension, as an alternative to one part of the Gas Referees' instructions.

In the first place, the Referees say: "The damper for "regulating the air supply to the burner shall be screwed "upwards until the flame is on the point of tailing above "the chimney, and then immediately be turned down only "so far as to ensure that the flame burns without any "smoking." But the prescription to which we particularly refer comes a little later. When the air-damper is screwed down to afford the maximum air supply to the flame, neat coal gas of (say) 19-candle power and upwards will tail above the chimney; but the Referees make provision for the retention of the one chimney by prescribing that, when the gas is so rich that it cannot be made to burn at the prescribed rate without tailing above the chimney or smoking, the rate of consumption is to be reduced below the 5 cubic feet per hour until the flame burns properly within the chimney. No doubt the change to a wider chimney would postpone by a little (say, $\frac{1}{4}$ or $\frac{1}{2}$ candle) the tailing-point with gas of gradually increasing richness, and consequently the necessity for coming below the 5 cubic feet rate. If the Twyford provision has been put in designedly, this must be its object; but as tailing does not occur until the damper is brought into action, unless the gas is coal gas of about 19 candles or over, it seems, to say the least, rather absurd to make such a provision in an Order asking for a 13-candle standard. With a mixed coal and water gas, the tailing point would be still higher.

The matter to which attention is here directed is the only novel one in the applications for Gas Provisional Orders in the coming session; and the novelty, it seems to us, is due to a mistake. If not, the reason should be of interest.

"Safety" Lighting in Purifier-Houses.

The Alliance and Dublin Consumers' Gas Company, their Chairman (Alderman W. F. Cotton, J.P.), and officials, may be congratulated that the effects of the explosion in the purifier-house at the Brunswick Street works last week were less serious than the first reports led one to suppose. Several men were unfortunately injured, and news reached London yesterday evening that one had succumbed; but our latest intelligence from the Chief Engineer (Mr. W. F. Cotton, jun.) is that most of those whom it was necessary to retain at the hospital are progressing favourably. Little structural injury was occasioned. This is an accident of a class that, in gas-works, great precautions are taken to avert. In this instance, it appears the men were working on the revivifying-floor beneath the elevated purifiers; and from some, as yet, unexplained cause, gas had accumulated under the boxes. The gas becoming ignited, the flame struck downwards, and burnt the men. It is from the point as to how the gas became ignited that perhaps a lesson is to drawn for future guidance. In a purifier-house where explosive mixtures may fortuitously be formed, the question of lighting has always been one for the careful consideration of gas engineers; but with all the care exercised, the old hand safety lamp, used by not too scrupulous workmen—among whom familiarity has all too often a bad way of breeding contempt—has, on becoming damaged, produced lamentable results. To avoid this, to enable night operations to be carried on with safety to both men and property, and to render unnecessary the use of a naked light anywhere in the vicinity of the purifier-houses, the Dublin Gas Company are among those who have introduced electric lighting plant. But this accident, it would appear, has proved that care must be taken as to how electric lighting is employed in purifier-houses. Mr. Cotton informs us that, so far as can be ascertained, the cause of the gas igniting is attributable to the fusion of an electric wire. The report of the occurrence in the "Freeman's Journal" states that: "The electric lamp bulb "hangs inside a metal frame, from the top of which the "wire stretches. This coil of wire was stripped for a space, "the insulating material was fused, the wire had sparked, "and the spark had caught the gas, causing the explosion. "Our representative was shown the defaulting lamp soon "after the occurrence." From this, it is patent, that the current was supplied to the electric lamp by flexible wires; and that it was "stripped for a space." From what has been learnt concerning the use of flexible electric wiring where the insulation is liable to be damaged, the avoidance of its use in the rough operations of a purifier-house, and in the hands of men more or less indifferent to danger, is to be commended. The experience suggests that (excepting perhaps the self-contained portable electric safety lamp) the electric lamp in the purifier-house does not offer, unless fixed and out of harm's way, any perfect security. And when fixed, much would depend upon how the work was done.

Competition in Australia.

As in unity there is strength, so also is there in conference. However strong and self-reliant a man may be, he is made all the stronger by being brought into contact with his fellows, and having an opportunity for interchanging views and experiences. Applying this to the gas profession, its truth has been accepted and proved wherever gas men are located within reasonable distances of each other; and if true in their favourable circumstances, how much more must it be so where gas men are separated by great distances, as, for example, in the case of the gas engineers and managers of Australia? With the high value we always place upon professional conference, the members of the Victorian Gas Managers' Association will fully agree, after the very successful meeting (reported in this issue) that they held early in November in Melbourne, under the presidency of Mr. R. O. Thompson, the Consulting Engineer of the Melbourne Gas Company. Young as the Association is, it has already, through this meeting, declared to the onlooker certain things; among them being that the gas profession of Australia is constituted of strong and self-reliant men, in whose hands the gas interests committed to their charge are safe, even hemmed in as they are, excepting in the case of the large cities and towns, by most disadvantageous circumstances. Remoteness from large centres and limited scope are two of the greatest disadvantages to cheap trading of any kind; and when to these is added competition, in which the old inhabitant does its best, within tight boundaries, to strangle the new, and the new to evict the old, the position calls for the exercise of the utmost resource. The smaller gas undertakings in Australia are at the present time engaged in the struggle with the (for them) new-born competition. Hence the considerable attention that was devoted to this subject, and generally to the commercial side of the gas business, at the recent meeting of the Association.

The Inaugural Address that the President delivered was a homely composition, in which he gave a superficial view of the current position of many interesting matters appertaining to Antipodean Gas Supply. The industry there has, in company with all other industries, suffered from the depression that followed the great boom of a few years ago. But the heavy cloud is lifting; and the gas industry is participating in the enjoyment of the brighter conditions. But it is a remarkably clear sky that has no cloud; and a cloud in the present more open sky of the Australian gas industry is constituted, as at home, of increased prices for coal and freights. But Mr. George Swinburne, whose interests in gas supply in Australia are many and wide, does not despair of the gas undertakings, by economical working, and by following a progressive policy, being able to pull through what, it is hoped, will only be a temporary drawback, without raising the price of gas to consumers. And considering the prices of gas in Australia, particularly in the smaller towns—owing to the heavy capital expenditure due chiefly to their isolated condition, and to in some cases the manner of their starting—those prices will not stand much tampering with in the upward direction, if the electric light is, in those places that are so small that they cannot with profit give elbow-room to two competing systems, to be defeated by the process of exhausting its strength to a point that will allow it to exist no longer. This touches on the paper presented by Mr. Bearup, of Hamilton, treating of the competition of electricity in small towns.

What the towns of modest population in Australia are going through at the present time is the reflection, on perhaps a reduced scale, of what has occurred in this country.

The smaller towns at home have been largely exploited by manufacturing concerns who have electricity plants for sale, and who (or some of them) have not much care as to what will happen later on, so long as they secure for themselves a profit on their machinery, cables, wires, and fittings. The same in Australia. When, again, the electric light is first introduced, the love of some people for being *à la mode* rises superior to other considerations. The same in Australia. But the experience in this country shows that the "other "considerations" ultimately sober down the love for what is, on its entrance, considered to be the fashionable light; and in numbers of residential towns, with the active competition of the gas undertakings, and the supply of lower illuminating power gas suitable for incandescent gas lighting at a cheaper rate, the electricity people are finding great difficulty in making both ends meet, and some cannot do so. There will be a day of heavy reckoning for certain of these undertakings, when plant requires renewal, with no sum for it set aside, and the poor financial returns upon present investment insufficient to induce investors to sink further money in the concerns. The same—notwithstanding the efforts made to enrol electricity consumers as shareholders—it may be predicted will happen in Australia, where, as here, an electricity undertaking has not so many branches to its business (all contributing support) as a gas undertaking, and where, as is not the case here, in the smaller towns, limitations as to time of use are placed upon the electricity consumers, of which, with other disagreeable experiences, they must tire in time. If experience at home under, it is true, somewhat different circumstances, is of value to Australia, then that experience is not encouraging to the hope of making electricity supply profitable in small residential towns, and therefore the experience likewise does not in such places encourage the idea of amalgamating the concerns, as was proposed by Mr. Bearup. Even in Australia, although such amalgamation enables the suppliers to maintain prices both for gas and electricity, instead of cutting them as where the undertakings are opponents in business, the successful amalgamation is the exception to the rule. Following the liberal policy advocated by Mr. George Swinburne, Mr. P. C. Holmes Hunt, and others, in the course of the animated discussions on Mr. Bearup's paper and that by Mr. W. Morris, on "Selling Gas," together with the exercise of the utmost economy in manufacture—not forgetting that a gas rich in illuminating power is not required where flat-flame lighting, as in many places in Australia, has been so largely abolished—then there can be little question as to the issue. "Confidence is the companion of suc-"cess;" and this meeting of the Victorian Association tells throughout of the confidence and of the virile constitutions of the members. One point more. Reverting to the address of the President, it seems that the State Legislature are more alive to the importance of the protection of gas and water pipes than are the Government of this country, for they have inserted a clause, in (what we take to be) a general measure dealing with electric tramways, safeguarding the pipes from the danger of electrolysis.

The Sulphate of Ammonia Market Last Year.

In another part of to-day's "JOURNAL" will be found some extracts from Messrs. Bradbury and Hirsch's "Review of the Market for Sulphate of Ammonia during 1906." This residual product of the distillation of coal figures so conspicuously in a gas manager's working statement that he is naturally concerned with the fluctuations in the market and interested in their causes. These are the matters which form the substance of the above-named pamphlet; and they deserve attentive consideration. Though sulphate of ammonia is, as the authors say, the *raison d'être* of their "Review," they first discuss the situation of nitrate of soda, because of its most important bearing upon the staple article. We, of course, can only give extracts from this portion of the pamphlet; but the whole of the authors' remarks on the subject are worth perusal by those who possess the "Review." Contrasting the two materials, it is shown that the average price of sulphate of ammonia delivered f.o.b. Hull last year was £12 os. 9d. per ton, while that of 95 per cent. nitrate of soda at Liverpool was £11 6s. 7d. per ton; and Messrs. Bradbury and Hirsch say it must be admitted that the result is disappointing. At the same time, when all the circumstances of the case are considered, they do not think the price is much below what the actual situation has justified. They do not see that the market has at any time suffered much from the operations of speculators. On the contrary, they think speculators have suffered more at the hands of the market. They estimate that the production of ammonia, calculated into sulphate, from all sources, in the United Kingdom last year was 283,500 tons, compared with 268,500 tons in 1905 and 217,500 tons in 1901. The most marked increase in this period has been the production from coke and carbonizing works and producer gas; the figures having risen from 18,000 to 55,500 tons. Looking to the future, Messrs. Bradbury and Hirsch say that, though a substantial increase in the production of sulphate may be counted upon, they do not think it likely to exceed 5000 or 6000 tons within the next four months. But they point to the enormous extension that has taken place in the use of fertilizers all the world over, and to the resulting larger general demand for nitrogenous material, of which sulphate of ammonia is by far the cheapest, and express the opinion that this demand will continue to come from places not hitherto thought of. As usual, there are at the end of the pamphlet several instructive tables, some figures from which we reproduce.

Municipalization at Hull.

Judging from the local papers, the citizens of Hull are having quite a lively time just now over the proposal of the Corporation to purchase the undertaking of the East Hull Gas Company—or the Sutton, Southcoates, and Drypool Gas Company, as it used to be called. The statutory meeting of ratepayers was held last week; and a report of the arguments there adduced will be found on another page. It seems that opinions were on the occasion pretty equally divided, though the Mayor declared that there was a majority present in favour of the proposal to purchase. This the opponents did not deny; but they are taking steps to secure a more definite expression of opinion on the part of the citizens generally than it is possible to secure from a public meeting, however well attended it may be. That is to say, a poll is being demanded; and until this has been taken, the fate of the scheme—so far, that is to say, as the inhabitants have power to determine it—cannot be known. Meanwhile, it will certainly not be the fault of the newspapers if the ratepayers fail to grasp the question that is before them; for, in addition to correspondence, reports of meetings, &c., numerous special articles have appeared which put forward the facts from one point of view or the other. It must be admitted, however, that the proposal does not meet with any very great amount of favour in these articles. There appears to be an idea that the Corporation have already as much on their hands as they are able to manage efficiently, and the writer of one of the editorial comments is unkind enough, in support of this contention, to make reference to the inferior quality of the Corporation electric light supply.

More Money Wanted.

Correspondents, with more consideration than the Chairman, Directors, and Secretary of the Ticehurst and District Water and Gas Company, have forwarded to us copies of a prospectus issued by that Company inviting tenders for further capital. The prospectus is addressed to "investors in parliamentary progressive water and gas companies." After reading all the Directors can say about the Company, and ascertaining what they have not said, we have come to the conclusion that there are other "parliamentary progressive water and gas companies" for which we should have for investment purposes greater preference than that of Ticehurst. The concern is run, it is seen, from No. 99, Cannon Street, which is the address of a few other little ventures which have had about them certain demerits that have not entitled them to our support, and so they have received the opposite thing. It is also the address of the Water-Works, Lighting, and Power Investment Corporation, Limited, whose name, judging from the frequency of its appearance, seems to be indispensable in the contracts of the Companies who have birth at the offices in question. From the present prospectus inviting the subscription of further money to swell the capital account of the Ticehurst concern, the names of the Chairman and Directors are omitted. Mr. E. Eaton who was (and so we suppose is now) the Chairman, is also a Director of other concerns that have not received whole-hearted encouragement in these pages; and it is also found that the name of Mr. B. Clark, the Secretary of the Company, has done duty occasionally as representing a sub-

scriber for "one" share in certain Companies whose prospects have not appealed to us as shining. However, the Ticehurst Company now require more money. They have already spent, it would appear, £64,955—that is to say, £37,610 has been issued as ordinary share capital, and £9145 as preference shares, together with £15,200 of 4½ per cent. debenture stock, and £3000 of debenture stock, to which is attached the word "provisional," which we take to mean that the Company have exceeded their borrowing powers. Of the total capital authorized, there now only remains a balance of 1000 ordinary shares of £5 each and 171 preference shares of £5 each; so that, when these shares are issued, the capital (including debenture stock) will stand at £70,790. The Directors have been sinking money fast in this concern, seeing that it was only "incorporated by Acts of Parliament, 1902 and 1904." We wonder whether that money has been laid out economically and to the best advantage? We also wonder who have benefited most out of the expenditure—the ordinary shareholders or others?

The Shareholders' Prospects.

If we look a little farther into the prospectus, it is gathered that the revenue from gas and residuals in 1906 is "estimated" at £1721 16s., or an increase of £149 9s. 11d. over 1905, which year exhibited an increase of £237 12s. 6d. over 1904. The Company cannot afford to omit the shillings and pence. The figures show a diminution in the rate of progress; and even, if one or other of these rates of progress could be maintained, it would be a far-distant posterity who would reap anything material in the shape of dividends upon the capital expended, which expenditure, by the way, is still going on, seeing that "a comprehensive scheme for the enlargement of the Ticehurst and Wadhurst Gas-Works has been completed, and also a considerable length of new gas-mains laid." There are no figures given as to the actual revenue from water, nor as to the total consumption of gas and water, prices charged, and other bits of information useful to assist judgment. But it is "estimated" that the *total* revenue from both gas and water at the end of 1907 will be about £2300. Now investors in "Parliamentary progressive water and gas companies" will note that this is revenue and not profit. From this revenue all the working, management, and maintenance expenses have to be paid; and then to discharge the full interest on the debentures and the dividend on the preference shares already issued, we make out not far short of £1300 is required. Nothing is said as to how far the Company have satisfied their interest obligations and dividend hopes, which, of course, is not an unimportant matter in inviting fresh capital. It is said that "substantial dividends were paid by the late Ticehurst private Gas Company." That may be true; but probably in that private Company there were invested fewer shillings than there are pounds in this one. We are amused with the naive statement that "the premiums on this issue of shares, *if any*, will form part of the capital of the Company;" also that "most Sussex gas and water companies are paying good dividends," and "the shares are at a substantial premium." We are prepared to guarantee that these conditions do not apply to the Ticehurst Company; and to assert that they are not likely to for many a long year—if ever, seeing the weight of capital the concern is carrying to-day.

The Agitation at Nottingham.

Another stage has been reached in the apparently interminable controversy at Nottingham. As will be seen by the report appearing in our "Miscellaneous News," a special meeting of the City Council was held yesterday (in accordance with the arrangement come to last week), for the purpose of discussing a resolution of which Mr. A. W. Black, M.P., had given notice, to the effect that no further steps should be taken in the matter of holding an inquiry. It had previously been decided by the Council that, in the event of the President of the Local Government Board refusing to institute an inquiry himself (as he has done), and those who gave evidence before the Investigation Committee refusing to consent to their statements being printed and distributed among the councillors (as it appears they also have done), the Corporation themselves should arrange for a public inquiry. The proceedings at yesterday's meeting were of a protracted character; but, at all events, something definite was arrived at as the result of them. Mr. Black's suggestion that no further steps should be taken in the matter was not adopted; but, instead, an amendment was carried which, after some minor alterations had been made on the suggestion of the Mayor, read as follows: "That the resolution passed by the Council on Dec. 3 last, with reference to investigation into the gas undertaking, be rescinded, and that a Special Committee of five members be appointed to hold a public inquiry into the working of the gas undertaking during the past five years." The resolution here referred to is, of course, the one by which the Council agreed to institute a public inquiry with the assistance of Sir Hugh Owen or Sir Albert Rollit. Now, at any rate, the inquiry will be confined to the Council themselves; though the selection of the five members of whom the Committee is to be composed will not be made until the next meeting of the Council. The terms of the amendment—that a public inquiry shall be held into the working of the gas undertaking during the past five years—seem to offer a pretty wide scope to the investigation; and it is to be hoped that at its conclusion the ratepayers will be fully satisfied—which the remarks made at the Council meeting yesterday show is not by any means the case at present. The one thing that will, more than any other, tend to bring about this desirable state of affairs, will be the adoption of the Mayor's suggestion that care should be taken that "there should be no mystery, but the fullest possible publicity, in regard to the matter."

Trade Prosperity.

There was a great outburst of gratification last week over the record figures shown by the trade and navigation returns for the past year. It was a remarkable year for business; and the total value of the import and export trade capped for the first time 1000 millions sterling—the imports having increased by £42,900,000, and the exports by £53,200,000. This shows a remarkable spreading, and at the same time acceleration of the flow, of the tide of trade prosperity that set in a few years ago. The metal trades especially have been particularly buoyant. In the almost general prosperity, an industry supplying light, heat, and power, dealing in raw and manufactured materials as the result of residual produce, and of the magnitude of that of gas, must have had a good participation. Our friends of the electrical manufacturing industry, as distinct from the electricity supply industry, are not at all well pleased with the position they occupy in the returns. Among the items of export, "electrical goods and apparatus" is the only one that exhibits a decrease; and, considering the advance there has been in the price of metals, the monetary decrease does not fully represent the actual decline. On the other hand, the imports of electrical goods have advanced by £177,000. The decrease under the one head, and the increase under the other, rather give support to those who have seen cause to urge the electrical manufacturing industry of the country to "wake up" and take a larger part in initiative work, instead of being content to slavishly follow where others lead.

The Funds of the Labour Representation Committee.

In the early part of last year, a County Court case was tried in Monmouthshire, which was brought for the purpose of testing the legality of Trade Unions making levies for the return and maintenance of Labour Members of Parliament. The defendants in the action were the South Wales Miners' Federation, of which organization the plaintiff—a miner by occupation—was a member. The action was to recover 4s. alleged to have been illegally demanded; and an injunction was asked for to restrain defendants from making similar levies in future, as well as a declaration that the Parliamentary Levy Rule was illegal. The plaintiff was entirely unsuccessful; and in recording the judgment at the time, we remarked that, unless this finding was reversed on appeal, the plaintiff would have to choose between the alternatives of paying the levy or of ceasing to be a member of the Miners' Federation. In this, however, we were mistaken, for the subsequent action of the Federation in compelling the colliery owners, under threat of striking, to employ none but Union men, left the plaintiff (if he lost his appeal) practically no alternative whatever—if he wished to continue his work in that part of the world as a miner. Last week the appeal came before the King's Bench Division (the claim for the return of the 4s., however, being dropped, owing to the finding of the County Court Judge that the money had been paid voluntarily), and was dismissed; so that now the plaintiff is in the position of having to contribute towards the support of a Member

of Parliament with whose political views he is not in accord. It has been strongly urged by the leaders of the Federation that it is for the good of the men to join the organization; but this case is a very clear illustration of the unfairness of compelling anyone to become a member of it against his will. The argument raised for the plaintiff at the appeal was that the definition of a Trade Union contained in the Act did not give any power to raise a levy for the purpose of the election and maintenance of Members of Parliament; but for the defence it was contended that, under the rules, there was ample provision for making the levy, and that, by taking a ballot of the members under the rules, everything possible had been done to observe them. In the course of his judgment (with which Mr. Justice Phillimore concurred), Mr. Justice Darling pointed out that, though the levying of a rate for the purpose referred to was not specified in the objects of the Union, neither was a levy for a benefit fund; and he thought both were permissible. He said that what the Court were asked to do was to interfere in the internal administration of the Association—and to interfere where all the members had been consulted. This they declined to do. Referring to the most interesting aspect of the case—that the plaintiff would be compelled to contribute to the support of a Member with whose politics he did not agree—Mr. Justice Darling remarked that the rule provided that the representative in Parliament "should press forward proposals conducive to the general welfare of the Association," which could be done whatever his politics might be. There may be some consolation to the plaintiff in this reflection; but there would be a good deal more if he could feel that he need remain a member of the Federation only so long as he chose of his own free will to do so. It is the loss of individual freedom of action that makes the whole matter so unsatisfactory. Probably, however, the last has not yet been heard of the case, inasmuch as plaintiff's Counsel asked for, and obtained, leave to further appeal against the judgment in the King's Bench Division.

Engineering and Machinery Exhibition.—It is announced that arrangements are being made for the holding of another Engineering and Machinery Exhibition at Olympia, from Sept. 19 to Oct. 19 next. It is anticipated that the display will be more extensive than the one held last year. Lord Armstrong and Lord Kelvin are among the patrons.

Scottish Junior Gas Association.—The quarterly meeting of the Eastern Division of the Association will be held in the Heriot-Watt College, Edinburgh, next Saturday afternoon, when two papers will be read—one by Mr. John J. Wight, on "Suction Gas Producers," and the other by Mr. Henry Rule, on "Stoking Machinery in Use at Falkirk."

The Chester Workhouse Water Supply Case.—In the "JOURNAL" for the 1st inst. (p. 42), we reported the proceedings in this case, which raised the question whether the Guardians of the Chester Union were entitled to a supply of water for their workhouse at the rate charged by the Chester Water Company for domestic purposes. The action was tried by Mr. Justice Jelf, whose reserved judgment was delivered yesterday in favour of the plaintiffs. A report will be given next week.

A New Electric Light.—According to the New York Correspondent of "The Tribune," Professor Parker, of the Columbia University, has invented an incandescent light which he hopes will revolutionize electric lighting. He declares that its efficiency is 45 times as great as that of an ordinary lamp fitted with carbon filament. Its special feature is a new filament, called helion, because its spectrum is similar to that of helium. In the tests which have been made, the new light burnt steadily from 485 to 1270 hours, with an average of 1000 hours, and it gives a white flame. Mr. Parker says it will last twice as long as a carbon filament lamp, besides carrying a large overload of electricity without breaking. A similar statement to the foregoing reached London yesterday through Laffan's Agency.

Allowable Pressures on Deep Foundations.—Data on allowable pressures on deep foundations, recently collected and analyzed by Mr. E. L. Corthell, show that the pressure of stable structures on the material on which they are founded ranges between the following limits: On hard clay, between 4000 lbs. and 16,000 lbs. averaging 10,160 lbs. in sixteen examples. On hard pan, between 6000 lbs. and 24,000 lbs., averaging 17,400 lbs. in five examples. These cases do not show any settlement. Settlement took place in fine sand, with a minimum load of 3600 lbs., a maximum load of 14,000 lbs., and an average load of 10,400 lbs. In clay—principally London clay—in five examples the pressure ranged between 9000 lbs. and 11,200 lbs., averaging 10,400 lbs. In silt and alluvium, two cases of settlement were reported with loads of 3200 lbs. and 15,200 lbs.—a wide variation. Three cases of failure on a mixture of sand and clay are given; the pressures ranging between 3200 lbs. and 14,800 lbs., averaging 6600 lbs. This should be compared with the average of 9800 lbs. and the range of 5000 lbs. to 17,000 lbs. in ten examples, already referred to, in which no settlement occurred.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 172.)

THE attitude of things in general on the Stock Exchange last week partook largely of the features which characterized the movements of the previous week. The opening was buoyant, and almost enthusiastic, as if everything was bound to rise like a balloon. But the rise was not a high one. After a little, it stopped; and the machine began to come down again. Less sanguine views then prevailed, and, later on, some tinge of despondency. Uncomfortable forebodings as to rates of contango were a flattening factor; but by the close, there was some recovery. Sensational incidents—such as smart coups in Siberian adventures—are not within our province. The Money Market opened with a fairly easy tendency; but soon, under the influence of gold movements, it stiffened materially, and this state of things continued to the close. Business in the Gas Market was well up to the mark in point of volume, taking the aggregate of transactions; but the distribution through the list was more than ordinarily uneven. There were not many changes in quotation, and they were inconsiderable in magnitude. The general tone in the London market, however, was good. The only exceptions came from the Provincial Exchanges, where two of the leading and the choicest issues had a set-back. In Gaslight and Coke issues, the ordinary was extremely active and buoyant. The opening bargain was at par (which had not been touched for some weeks); and though 99½ was afterwards marked, the price steadily rose from that to 101¾, at which figures the concluding bargain was done. The quotation had advanced a point; but for some reason (or none at all), half of this was knocked off on Saturday. The secured issues also were busier. The maximum changed hands at from 89¼ to 89¾; the preference at from 107¾ to 108½; and the debenture at from 84½ to 86. South Metropolitan was rather quiet, and not disposed to rise. The dealings marked were all between 128 and 129. The debenture was done at 85½ and 85¾. Hardly anything was done in Commercials; one bargain in the 4 per cent. at 111 being all the business marked. The Suburban and Provincial group was at about its usual low pressure. Alliance old was done at 21⅜, Bournemouth "B" at 17 special, Brentford old at 264, British at 42½ and 42¾, South Suburban at 124, ditto debenture at 130, and West Ham at 104. On the local Exchanges, Liverpool "A" fell 2, and Newcastle another ½. Business was moderate in the Continental Companies. Imperial opened at 177½, and worked up to 179⅛ (a rise of ½ in the quotation); but neither Union nor European had any dealings in them. Among the undertakings of the remoter world, Bombay old was done at 6 15/16 and 7 (a rise of ¼ in the quotation), ditto new at 5⅛ free, Buenos Ayres at 11⅝, Cape Town preference at 9¼, Hongkong at 19¾, Primitiva at from 7 9/16 to 7¾ (a rise of ¼), ditto preference at 5 5/16, ditto debenture at 95⅛, River Plate at 12⅜ and 12 9/16, ditto debenture at 95½ and 96⅛, Monte Video at 12¼, and San Paulo debenture at 49¾. Ottoman rose ¼.

The closing prices are shown in our Stock and Share List on page 172.

ELECTRIC LIGHTING MEMORANDA.

A New Electrical Contemporary—Mr. Solomon on Old Lamps and New—The Electrical Delinquencies in Oxford Street—Electrical Fires—Unrealized Hopes.

WELCOME is to be given to another electrical contemporary—"Electrical Engineering." Extraordinary competition is a salient feature of the electrical industry; and the competition in its electrical literature has become so severe that friends may fear for the existence of certain of the papers as commercial successes. But that is no business of ours. Welcome is accorded to the new venture for the sound character of the original articles that appear in the first two issues, all of which are readable and instructive, and show a wise selection on the part of the Editor, and an influence in obtaining good material. If the standard set at the opening of its career is adhered to, we shall hope that the newcomer will not be among the least successful of the technical papers that so worthily (if occasionally extravagant in statement) fulfil an important duty in the great competing industry.

In the first number of our new contemporary, is an article by Mr. Maurice Solomon, under the title line of "Progress in Incandescent Lamps." The picture of "progress" that Mr. Solomon, in his great wisdom, draws is not one calculated to cause the springs of hope in the breasts of electricians to rise above the normal low condition of some years past. Mr. Solomon confirms what other observers have noted, that the work on the metallic filament lamps, though it has not all been a mistake, has, like the lamps themselves, its limitations in usefulness; and that the limitations of the lamps that have resulted from the work will cause them to be of comparatively small value to the electrical industry of this country. We have seen in another quarter, the deficiencies, uncertainties, and vagaries of the Nernst and the Tantalum lamps paraded in all their nakedness; and now Mr. Solomon, "taking everything into consideration" (which is a very proper thing to do) says "there is every probability that the metallic filament lamp will play an important part in the development of electric lighting, though it is doubtful whether it will

seriously disturb the carbon lamp for some time to come, except perhaps by gradually restricting carbon lamps to high voltages. An examination of the whole subject leads to the conclusion that the attempts at improvement by finding materials capable of withstanding high temperatures, have almost reached their limit. In every direction, progress seems blocked by limiting temperatures. They limit the efficiency of the high-voltage carbon lamp, and the voltage of the metallic filament lamp. Those who wish to make further progress must turn their attention to another field, and seek to produce light efficiently otherwise than by raising the temperature of a solid body." As Mr. Solomon has taken "everything into consideration," has made "an examination of the whole subject" and "in every direction," we must perforce bow to his conclusion.

Mr. Solomon does not regard the old carbon filament lamps as being bad things on the whole. Their all-round serviceability is an important point in their favour, which cannot be set aside by the greater and undisputed efficiency of the metallic filament lamps, on which alone they base their claims to popular favour. But that is not sufficient. In the first place, there is the Nernst lamp; and respecting it our present author says that, with its complicated preheating mechanism, it can hardly be said even now to represent more than an intermediate step in the evolution of a really commercial high-efficiency lamp. In any case, this complication must always militate against its popularity. Apart from the obvious disadvantages for many purposes of the slow lighting up, the existence of mechanism always liable to get out of order, and requiring technical supervision for its maintenance in an efficient condition, is a powerful deterrent to the use of the lamp. And these are not the only drawbacks that have been divulged by more extended use. Then as to the Osmium lamp, the brittleness of the filament is a considerable drawback, and has hindered the success of the lamp. Besides which, the high conductivity gives rise to the difficulty common to all metallic filament lamps, that they can only be used for low voltages. As to the Tantalum lamps, Mr. Solomon states that recent tests of these show an average life of nearly 2000 hours, at an average power consumption of 1·8 watts per candle. The Wolfram, the Osram, and the Osmin lamps all claim much—a consumption of about 1 watt per candle, and a life of 1000 to 3000 hours. But, as the author says, no independent tests are available from which to form any satisfactory estimate of their possibilities. Anyway, this we do know, that the low voltages with which they can only be employed will not induce any large popularity in this country. Metallized carbon filament lamps, as developed in America, are said to have as long a life as the ordinary carbon filament lamp, but are capable of being run at 2·5 watts per candle. The reduction in the resistance of the filament is obviously a move in the wrong direction. Mr. Solomon wisely acknowledges the difficult task of the electrical engineer in having to compete in cost with the incandescent gas-light. Of course, the successful introduction of such lamps as the Tantalum or the Wolfram might be expected to lead to considerable further development of the electric light; but Mr. Solomon admits that it would be premature to say this was already in sight. Such caution is admirable. We cannot, however, agree with him that one need not feel concerned about the initial cost of the lamps, as knowledge of what householders will not do in the way of providing expensive fittings decidedly leads one to a totally different conclusion. However, the great drawback to the metallic filament lamp is the difficulty of making it for high voltages; and unless this can be overcome, it will be very hard for the metal filament to displace the carbon filament in this country, and for the carbon filament to displace gas mantles. The Editor of our new contemporary, it may be inferred, coincides with this view, inasmuch as he observes: "There is no reason why sub-stations supplying small outlying areas should not now be designed for a secondary voltage of 110, so that the consumers may profit by the new high-efficiency lamps that are obtainable." If the new lamps are going to be chiefly useful for small outlying districts, we are content to leave the matter where it is for the present.

Many shopkeepers in Oxford Street and certain other choice parts of the Borough of Marylebone have been made sadder but wiser by the sore chastening that they have had through putting their whole trust in electricity for lighting purposes. In about a fortnight, just at eventide when the Christmas and New Year's business was proceeding in a manner to make the tradesman's heart rejoice, there were two failures of the electric light—each time lasting about twenty minutes—the causes of the accidents being of a character to which, so the Chairman of the Marylebone Electricity Committee will aver, electricity plant is very susceptible. It was not intended to refer to the matter again this week, but we are constrained to take the earliest opportunity of endorsing the view of an electrical contemporary that "twenty minutes' darkness means a serious risk to some of the shops, jewellers' and drapers' especially," and that "it is high time something was done to prevent repetition of this kind of thing." But what is to be done? We read in a note, in another electrical contemporary, referring to the Borough Council's new station, that "no reasonable precautions to ensure continuity of supply have been neglected." Still the failures! There has been some smart work in restoring gas-fittings, and in providing for emergencies, in the Marylebone and South Metropolitan electricity supply districts; and lamp, oil, and candle dealers have likewise reaped a good harvest.

Electricians continue to protest that there is nothing so safe as electricity for lighting. In one electrical contemporary, we see it freely acknowledged for the first time that the large fire at a South London drapery establishment, which did damage to the extent of £30,000, was due to an assistant making some alterations or adjustments in connection with a hanging lamp in the shop window, and that the flexible cord on which the lamp was suspended caught fire, and communicated the fire to the inflammable material near by. Flexible conductors drop in for some pretty severe condemnation as the weakest part of an electric light installation. Each of these conductors consists of 40 wires or more, 0·0076 inch diameter—this small size being chosen for the sake of flexibility. The insulation of these wires gets rubbed off; and our contemporary is of opinion that it speaks well for the protection afforded by the fuses that fires are not more frequent. Perhaps they are more frequent than the writer of the article believes to be true—or will acknowledge. In the same article, consumers are exhorted to avoid kinks in their wires; it would have been to the advantage of many consumers if they had avoided the wires altogether. The writer goes on to remark that he regrets to say "it is not the consumer only who needs to be cautioned;" and the wiring contractor is then brought into it. After the accusation against flexible wires, and the cautioning of contractors, the writer makes this really philosophic statement: "Although frequently accused of causing fires of which the true cause is untraceable, it is certain that electric lighting is rarely the actual source." There is a kink in this flexible sentence. If the "true cause is untraceable," how can there be any certainty that "electric lighting is rarely the actual source?" Probably it is in the untraceableness of the work of electricity in causing conflagrations that it has its greatest protection. While there is cautioning of the electrical contractors, these gentlemen bemoan their fate in having to please so many people. Nearly every Fire Office has its own rules for electric installations; nearly every station engineer issues rules which he cannot enforce; consumers have their own fancies; and architects their little foibles. So between them all, the lot of the honest electrical contractor is not a happy one. We have asked before, why there should be all this necessity for rule and regulation, if electricity is that angelic, tractable something of which we read in the Electrical Press. In the Daily Press we are told of fires being caused by the fusion of electricity wires, reports to the same effect are given by expert fire authorities, we read of railway carriages catching fire in the "Tubes," and we learn, to take the latest fatality, of the death of an electrician at Chester through a switchboard suddenly becoming enveloped in flame. But all the same, we are asked to believe that electricity is innocent of harm. Cynical Carlyle believed that the population of the world were mostly fools; the writers in the Electrical Press are apparently in full accord with him.

Some years ago, when Parliament was engaged in carving up the country among the Electricity Power Companies, it was remarked in the "JOURNAL" that there ought to be a staying of the hand in the defence of the investing public, until one or two pioneer companies had proved themselves. Parliament continued in indolent fashion to accept the prophecies of the company promoters as absolute fact. The companies were floated; the public were induced by specious prospectuses to put their money into these concerns; and to-day the shareholders find, in more than one notable case, that they are part proprietors of white elephants. Complete disaster has just overtaken the South Wales Electrical Power Distribution Company. It has been threatening for some months past. The exaggerated prospects of business that were held forth, and which produced the sanguine expectations of good profit on investment, have been proved baseless by the expenditure of £899,006 of shareholders' and unpaid creditors' money. After reading the long "tale of woe" told by Mr. Stanley Boulter at a meeting of the debenture holders of the Company yesterday week, there is no getting away from the fact that the end has now come. Not only has the considerable sum of money named been virtually lost, but such few large consumers as the Company have had are fitting up private plants of their own; and do what they will, the Company can only get guarantees of business to an amount not one-third of what they must have to enable them to maintain a bare living existence. The consternation there was among the central station people when the Company advertised supplies to the ordinary consumer at ¾d. per unit is now remembered as a humorous incident in the chequered career of the Company. But the noise of the big drum has ceased; the best part of a million of money has been swallowed up; men have lost more than they could afford to lose; and the debenture holders are looking to rescuing all they can for themselves from the terrible waste. Again, an article which appeared in the "Manchester Evening News" a few days ago on the subject of "Electrical Progress in Lancashire" shows that there hopes have not been realized—that in every direction the advance is a tardy one. And this in industrial Lancashire!

We are glad to announce that the satisfactory progress of Mr. Norton H. Humphrys towards recovery from his recent serious illness, which we were able to report last week, has resulted in convalescence. Mr. Humphrys has now left Salisbury for a change, but hopes to resume his duties before the end of the month. He asks us to express to his friends his thanks for their sympathy, which greatly cheered him in the critical time through which he has passed.

NEW ACTS AFFECTING INDUSTRY.

A Glance at their Provisions.

A FORTNIGHT ago, in our editorial columns, reference was made to the various Acts that were passed last year affecting labour and industry; and consequently of labour and administration in the gas industry. In the "Miscellaneous News" last week (p. 103), the provisions of one of the measures—the Notices of Accidents Act—were brought under notice. The Trades Disputes Act, the Workmen's Compensation Act, and the Census of Production Act have also now been published; and it may be useful to readers if we make a general survey of their provisions, without particularly commenting on them. There has been comment in abundance over these Acts during their evolution, both in Parliament and in the Press; and nothing can now change any oppressive or inequitable condition or privilege in one or other of the measures excepting by the amending power of Parliament itself. They must, therefore, be accepted as they stand as part of the law of the land.

Trades Disputes Act.—Measured by length this Act is not a formidable one; measured by substance, it is most harmful. It is the product of the labour and socialistic representatives in Parliament, assisted by a Government whom the wire-pullers in this matter found pliable to an undignified degree. On all points, the Government yielded to demand, with the result that trades unionism and trades union tactics have now a legalized liberty never before enjoyed. At the outset, there is a new paragraph added to the first part of section 3 of the Conspiracy and Protection of Property Act, 1875, which enacts that "an act done in pursuance of an agreement or combination by two or more persons shall, if done in contemplation or furtherance of a trade dispute, not be actionable unless the act, if done without any such agreement or combination, would be actionable." Then we have countenance given to "peaceful picketing"—this being an elastic term which can be stretched according to the consciences of those engaged in it. It is now pronounced lawful for one or more persons acting on their own behalf, or on behalf of a trade union, or of an individual employer or firm, in contemplation or furtherance of a trade dispute, to attend at or near a house or place where a person resides, or works, or carries on business, or happens to be, if they so attend merely for the purpose of peacefully obtaining or communicating information, or of peacefully persuading any person to work or abstain from working. Thus it will be seen that, prior to and in times of dispute, no one who is peacefully working, and desires to continue to so work, for an employer, will be immune, in any place, not even in his own home, from the unwelcome attentions of those engaged in a prospective or present dispute. Then there is a section that has the effect of repealing a large part of section 7 of the Conspiracy and Protection of Property Act, 1875. It removes the liability for interfering with another person's business, by providing that an act done by a person, in contemplation or furtherance of a trade dispute, shall not be actionable on the ground only that it induces some other person to break a contract of employment, or that it is an interference with the trade, business, or employment of some other person, or with the right of some other person to dispose of his capital or his labour as he wills. This clearing of the path of trade unionists, and their protection against legal proceedings, continue in a clause which completely prohibits actions of tort against trade unions. It provides that an action against a trade union, whether of workmen or masters, or against any members or officials thereof on behalf of themselves, and all other members of the union in respect of any tortious act alleged to have been committed by, or on behalf of the trade union, *shall not be entertained by any court.* Nothing in the section, however, will affect the liability of a trade union to be sued in the events provided for by the Trades Union Act, 1871, section 9, except—and this is the important part of this provision—in respect of any tortious act committed by, or on behalf of, the union in contemplation or in furtherance of a trade dispute. The insertion in the clause of the words "or masters" suggests that the union of employers for defensive purposes will have to become a more common feature than hitherto of our industrial life. Another effect of the Act will, without doubt, be the broadening of the breach between employees and capital.

Workmen's Compensation Act.—This Act is of considerable length; and its great scope is ascertained by first referring to its latter part to obtain the definition of "workman." It is found that the term—

> "Workman" does not include any person employed otherwise than by way of manual labour whose remuneration exceeds £250 a year, or a person whose employment is of a casual nature, and who is employed otherwise than for the purposes of the employer's trade or business, or a member of a police force, or an outworker, or a member of the employer's family dwelling in his house; but, save as aforesaid, means any person who has entered into, or works under, a contract of service or apprenticeship with an employer, whether by way of manual labour, clerical work, or otherwise, and whether the contract is expressed or implied, is oral or in writing.

Therefore the term "workman" includes all employees, save those receiving more than £250 a year and whose occupation is other than manual, and members of a police force, an outworker, or a member of an employer's family dwelling in his house. It is necessary also to ascertain the interpretation of an "outworker." It is a person to whom work is given for execution in his own home or on other premises not under the control or management of the employer. But in connection with this, it is clear that the workers in premises in the districts of (say) gas-supplying companies and local authorities cannot be described as "outworkers," for "the exercise and performance of the powers and duties of a local or other public authority shall, for the purposes of this Act, be treated as the trade and business of the authority."

We have seen by the foregoing how thoroughly—with few exceptions—the Act (which by-the-by comes into operation on July 1 next) enfolds all kinds of labour. As to the far-reaching character of the liability for personal injury by accident arising out of employment, this is best impressed by noting what little exemption margin is allowed. An employer will not be liable under the Act in respect of any injury which does not disable the workman for a period of at least one week from earning full wages at the work at which he was employed; and, furthermore, if it is proved that the injury to a workman is attributable to the serious and wilful misconduct of that workman, any compensation claimed, in respect of that injury, shall, unless the injury results in death or serious and permanent disablement, be disallowed. Those are the only exemptions; and the gross unfairness of the last one is all too palpable. A workman may be guilty of "serious and wilful misconduct." If that conduct does not kill him or seriously or permanently disable him, the employer is not to compensate him; but if the man's "serious or wilful misconduct" causes his death or seriously or permanently disables him, the employer is liable under the Act. It is also well for employers to note that, when the injury is caused by the personal negligence or wilful act of the employer, or of some person for whose act or default the employer is responsible, nothing in the Act is to affect any civil liability of the employer; but, in this case, the workman may, at his option, either claim compensation under the Act, or take proceedings independently of it. The employer, however, is not to be liable to pay compensation for injury to a workman by accident arising out of, and in the course of, the employment, both independently of, and also under, the Act, except in case of personal negligence or wilful act. If any question arises as to compensation, and cannot be composed by agreement, then provision is made for the manner of settlement by arbitration. If, too, action is taken to recover damages independently of the Act, and the Court holds that the injury is not one for which the employer is liable in such action, but that he would have been liable to pay compensation under the present Act, the action is to be dismissed. But the Court is, if the plaintiff so chooses, to assess the compensation, deducting the costs which, in its judgment, were caused by the plaintiff bringing the action, instead of proceeding under the Act. Again, proceedings for the recovery of compensation will not be maintainable, unless notice of an accident has been given as soon as practicable after the accident, and before the workman has voluntarily left the employment in which he was injured, and unless the claim for compensation is made within six months from the occurrence of the accident causing the injury, or, in case of death, within six months from the time of death. In this connection, there are protective clauses, bearing upon want of, or defect and inaccuracy in, notices, through mistake, absence from the United Kingdom, or other reasonable cause. Directions as to giving notice are included.

There are considerable regulations regarding contracting out, which are well worth pausing over. If a Registrar of Friendly Societies, after taking steps to ascertain the views of the employer and workmen, certifies that any scheme of compensation, benefit, or insurance for the workmen of an employer in any employment, provides scales of compensation not less favourable to the workmen and their dependants than the corresponding scales contained in the Act, and that, where the scheme provides for contributions by the workmen, the scheme confers benefits at least equivalent to those contributions, in addition to the benefits to which the workmen might have been entitled under the Act, and that a majority (ascertained by ballot) of the workmen to whom the scheme is applicable are in favour of the scheme, the employer may, while the certificate is in force, contract with any of his workmen for the provisions of the scheme to be substituted for the provisions of the Act. Thereupon, the employer will only be liable in accordance with the scheme. Certificates will expire at the end of limited periods of not less than five years, but may from time to time be renewed, with or without modifications. It is important that employers should notice that no scheme will be certified which contains an obligation upon the workmen to join it as a condition of their hiring, or which does not contain provisions enabling a workman to withdraw from it. Provisions are made for the revoking of certificates on the Registrar being satisfied that the conditions of a scheme do not continue to comply with the requirements of the Act.

There is a most important section referring to sub-contracting, which will make it necessary for those entering into, and undertaking, contracts to ascertain their precise position. By it any person (referred to as the principal) who, in the course of his trade or business, contracts with any other person for the whole or any part of work undertaken by him, the principal is to be liable to pay to any workman engaged in the execution of the work any compensation under the Act which he would have been liable to pay if the workman had been immediately employed by him. But a principal may be indemnified by any person who would have been liable to pay compensation to an injured workman

independently of this section. Nothing, too, is to prevent a workman recovering compensation from the contractor instead of the principal. And, furthermore, the principal is protected by a provision which frees him from liability in any case where the accident occurs elsewhere than on, or in, or at the premises on which the principal has undertaken to execute the work, or which are otherwise under his control or management.

There are a number of provisions dealing with cases in which the bankruptcy of an employer is involved; and a section provides for remedies against both employer and stranger, though the workman will not be entitled to recover both compensation and damages. The Act applies to half-a-dozen industrial diseases mentioned in a schedule; the one which has the nearest interest for the gas industry being lead poisoning or its sequelæ.

Among the schedules to the Act is one giving, in extended form, the scale and conditions of compensation, and a second sets out the rules affecting arbitration.

Census of Production Act.—This is an Act that provides for a census of production being taken in 1908, and subsequently at such intervals as may be determined by an order made by the Board of Trade as soon as practicable after the taking of the first census. The census will be under the superintendence of the Board of Trade, who will issue such forms and instructions as they may deem necessary; the expenses incurred being paid out of money provided by Parliament. The particulars will be required in respect of the calendar year next preceding the date of the census, or any part of the year as may be prescribed; and their nature will be as to the trade or business, output, number of days on which work was carried on, number of persons employed, power used or generated, and matters of a like nature (except the amount of wages) as may be found to be necessary for the purpose of enabling the quantity and value of production to be ascertained. Manufacturers and contractors where subject to competition will regard with thankfulness the condition that no individual return, or part of one, will, without the previous consent of the owner of the undertaking, be published, except for the purposes of a prosecution under the Act; and persons engaged in the census are to make a declaration not to disclose or use, except for the purposes of the Act, any part of a return. Contravention will be a misdemeanour; and, on conviction, any guilty person will be liable to imprisonment, with or without hard labour, for a term not exceeding two years, or to a fine, or to both. On the other hand, persons refusing or neglecting to fill up a form, or who make a false return, will be liable, on conviction, to a fine not exceeding £10, and in the case of a continuing offence to a further fine not exceeding £5 for each day during which the offence continues. The exercise or performance by a local or other public authority of the powers of that authority is to be treated as trade and business. In addition, from the schedule, it is remarked that, among the persons who will be required to make returns are the occupiers of every factory or workshop within the meaning of the Factory and Workshop Act, 1901; the owners, agents, and managers of mines and quarries; builders undertaking the construction or alteration of a building, or any part of it; every person executing, by way of trade or business, works of construction, including embankments, reservoirs, or wells, or laying or altering gas or water pipes, electric lines, and other prescribed work; and every person carrying on any other trade or business which may be prescribed.

Truly, the burdens of industry are increasing!

Competition for a Road-Tarring Machine.

The Roads Improvement Association, acting on behalf of the Automobile Club and the Motor Union of Great Britain and Ireland, have issued the rules for a competition to decide the best means of mechanically spreading tar upon road surfaces in such a manner that it will bind the materials together and not merely form a coating. The merits of the competing appliances will be judged entirely by the results of the operation; the chief consideration being the efficiency with which the tar penetrates the road and the cost of application. Tarring has, so far, proved superior to any palliative for laying dust; but the method of application by hand is expensive. It involves the use of an excessive quantity of tar, and the creation of mud and a small amount of dust of an objectionable character. It is necessary to so far reduce the cost and increase the efficiency that the treatment may be applied to all the principal roads throughout the country. Efforts to induce manufacturers of municipal appliances to design and submit an apparatus for trial not having proved successful, a suggestion was made to the Motor Union by a leading county surveyor that automobilists should organize a competition for an apparatus that will spray the tar under such pressure as would enable it to penetrate deeply into the road, reduce the waste of tar, and require the minimum of unskilled labour. The Judges appointed by the Council of the Roads Improvement Association to determine the comparative merits of the competing appliances include seven representatives of the Automobile Club, the Motor Union, and the Roads Improvement Association, and five leading City and County Engineers, appointed after consultation with the Incorporated Association of Municipal and County Engineers —*i.e.*, the City Engineers of Liverpool and Birmingham, and the County Surveyors of Middlesex, Hampshire, and Kent—the gentleman occupying the last-named position being Mr. H. P. Maybury, M.Inst.C.E., who was formerly Gas Manager to the Malvern Urban District Council.

POSITION OF ENGLISH COMPANIES IN FRANCE.

In the course of last week, attention was called by the London Chamber of Commerce to an important Bill affecting foreign companies trading in France, which has been deposited by the Government in the Chamber of Deputies. A special meeting was called to consider what representations should be made on the subject to the Secretary for Foreign Affairs; and the interest taken in the matter was evidenced by the good attendance. The chair was occupied by Mr. Charles Charleton, the President of the Council of the Chamber, who explained that the measure had been brought forward in consequence of certain legislation contemplated with reference to French companies; and if it passed, an English company establishing itself in France would have to register in such a way that a tax of ¼ per cent. would be levied not merely upon the proportion of the capital represented in the country, but upon the whole of it. Among the other obligations imposed were these—that a certified translation of the whole of the Articles of Association would have to be registered and deposited, together with a description of the undertaking and its objects, and a statement of the remuneration of the directors and managers, and a full balance-sheet would also have to be registered. Mr. Charleton explained that the meeting had been convened without the slightest feeling of hostility; the sole desire being to put the position of English companies clearly before the French Government, and request that they might not be forced to withdraw from the country, as many would have to do if the Bill became law.

In the course of the discussion, Mr. J. Prinsep, representing certain mining undertakings having a capital of about £10,000,000, pointed out that the proposed tax would fall very heavily—to the extent of £25,000—upon them, apart from the additional imposts in the shape of fees, stamps, and demands on the issues of new capital. He said he had been advised that many of the leading French bankers had expressed themselves to their Government as opposed to the measure, as being likely to hamper the operations of English companies in Paris. French companies in England were not subjected to any such extra taxation; and he claimed that there should be equality of treatment in the two countries. Mr. Frank Debenham thought the Bill was levelled at French companies registered under the English Companies Acts. The Chairman said he had heard that there was no intention to press the Bill; but it was necessary to guard against the danger of its passing. Sir Samuel Boulton (Messrs. Burt, Boulton, and Haywood, Limited) remarked that, during half-a-century of business in France, his Company had nothing, even in times of political excitement, but the most pleasing experiences in their relations with Frenchmen. He did not think there was on the part of the French Government any feeling against English manufacturers and merchants in France; and the suggestion that a company having a capital of a million sterling, but employing only £10,000 in the country, should pay a tax of ¼ per cent. upon the whole of the capital, would, in his opinion, be ridiculous and prohibitive. The outcome of the meeting was the passing of a resolution expressing the opinion that a deputation from the Chamber should wait upon the Foreign Office, in order that the necessary representations should be made to the French Government to secure that the new legislation (if any) should be drafted on lines that would not weigh unduly on companies represented in both countries.

The decision was a good one as a measure of precaution; because, though, as suggested by some of the speakers, there may be no intention on the part of the Government to hamper English enterprise in France, the Bill will affect English companies—and, of course, gas companies—carrying on operations in that country, inasmuch as it will put all foreign undertakings on the same footing as those that are indigenous, which have to bear a registration duty of ¼ per cent. on their total capital. The Bill aims at the restriction of undesirable foreign companies, of which a large and increasing number have been formed of late years to carry on operations in France; and, moreover, it embodies a means of raising money for revenue purposes. The proprietors of French undertakings—notably those connected with insurance—have been complaining loudly of the unfair competition in their own country of foreign undertakings which are free from the burden of registration duty; and the Government appear to have taken advantage of this dissatisfaction to introduce their Bill. Though it is not specifically stated therein that a registration duty will be imposed upon foreign undertakings, it stipulates that their status is to be assimilated to that of native traders; and as these have all to pay the duty, it follows that foreign undertakings will have to do the same. That this will be a serious matter for English companies having branch establishments in France, is obvious; and therefore we shall await with interest the result of the action of the Chamber of Commerce. Should this, or any representations that may be made to the Government official in charge of the Bill, be unsuccessful in preventing an enactment which will be manifestly unfair to English companies, the only course for the latter to take will be to convert their branch establishments into separate French companies, in which case the registration duty will be payable on only the portion of the capital engaged in the French business.

In connection with the subject under consideration, attention may be called to a letter which appears in our "Miscellaneous News" to-day.

GAS PROVISIONAL ORDERS FOR 1907.

THIRD ARTICLE.

UNDER the Gas and Water Facilities Act, 1870, applications to the Board of Trade for powers have been made by a few Gas Companies; and the objects in view may be briefly reviewed.

To enable them to raise additional capital and for other purposes, the Freshwater Gas Company are applying to the Board of Trade for a new Order. The further capital powers proposed are not to exceed £13,000, including premiums; and the limitation of the capital in the whole is to be £25,000, until the Company receive authority to raise further money. On issues as ordinary capital, the maximum dividend is 10 per cent.; and on issues as preference capital, the dividend is not to exceed 6 per cent. The borrowing powers sought are equal to one-fourth the total amount of the capital; and on issues no higher rate of interest than 5 per cent. is to be paid.

The New Tredegar Gas and Water Company, Limited, are seeking to extend their capital powers by an amount of £7500, including premiums on the sale. The whole capital is then not to exceed £12,250. The dividend is limited to 7 per cent. on that part of the additional capital issued as ordinary and 6 per cent. on preference capital. The borrowing powers, it is proposed to restrict to one-fourth of the capital; the highest rate of interest payable being 5 per cent. The part relating to the water undertaking will be dealt with later. The remaining clauses mainly give direction as to the issue of the new capital. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Seaford Gas Company, Limited, are desirous of being invested with several new powers. First with respect to money, they ask that their capital powers may be extended to £54,000, including £41,000 of 10 per cent. original capital and £13,000 of 7 per cent. additional capital. It is requested that borrowing powers be allowed to the extent of one-third of the issued capital. The applicants are contemplating a renewal fund. In addition to lands described in a schedule, the Company propose powers of purchase by agreement up to 3 acres. The illuminating power of gas is to be 14 candles, the price of which is not to exceed 5s. per 1000 cubic feet. The model prepayment clauses are adopted. The promoters are taking power, if they think fit, to allow discounts to consumers up to 10 per cent. for prompt payment, and 15 per cent. for large consumption. Testing clauses provide for the use of the Metropolitan argand burner No. 2, a bar photometer, and Harcourt's ten-candle pentane lamp; but provision is being made for the undertakers and the District Council agreeing, if at any time they think fit, upon any regulation with reference to the testing of gas, in addition to, or in substitution for, the provisions contained in the Order. The Order embraces a purchase clause in favour of the District Council, operative for five years.

Another purely money application is that of the Skegness Gaslight and Coke Company, Limited. They are asking for an additional £15,000, with the limitation of the whole share capital to £26,000. On the new capital the dividends are to be limited to 7 per cent. on ordinary capital and 5 per cent. on preference capital. The borrowing powers are not at any time to exceed in the whole the amount limited by section 15 of the Company's Order of 1902, and one-third of the amount of the capital raised under the new Order. Interest is to be limited to 5 per cent.

Further money powers are likewise required by the Twyford (Berks) Consumers' Gas Company, Limited. Of the intended limitation of the share capital—£19,300—the proposed additional capital is £15,000. The maximum dividend on the original share capital of £4300 is 10 per cent.; on the additional capital issued as ordinary, 7 per cent.; and on the preference capital, 6 per cent. The borrowing powers are named at one-third of the issued capital. The Company desire power to purchase lands by agreement up to 3 acres. In regard to illuminating power, the proposal is 13 candles, with a maximum price of 5s. per 1000 cubic feet. The Metropolitan argand burner No. 2 is prescribed for the testing, with a 6-inch by 1⅝-inch glass chimney, "and, if at any time the gas-flame tails over the top of the glass, a 6-inch by 2-inch chimney shall be used."

The Woking District Gas and Water Company, Limited, are likewise seeking additional capital powers. Their requirements are £30,000; and the amount named as the limitation of the whole capital is £66,000. The maximum dividend on the additional ordinary capital is proposed at 7 per cent., and 5 per cent. on preference capital. It is contemplated that the borrowing powers shall not exceed one-fourth of the amount of the capital; the interest being not higher than 4 per cent.

To the Secretary for Scotland, three Corporations are making application for Orders containing proposals regarding additional gas powers.

The gas clauses in the gas section of the Aberdeen Corporation Order are few but important. The first clause is intended to confer power on the Corporation to utilize in connection with manufacture a small piece of additional land. They ask for power to supply gas for all purposes upon such terms and conditions as may be agreed between the Corporation and the person to whom such supply shall be given. The Corporation also request power to supply 15-candle gas, tested by the Metropolitan argand burner No. 2, the bar photometer, and Harcourt's ten-candle pentane lamp. A proviso states "that while and so long as the gas supplied by the Corporation shall with respect to its illuminating power be more than 20 candles, the burner to be used shall be that known as the union jet." [*Parliamentary Agents: Messrs. Martin and Leslie.*]

Part 6 of the Dundee Corporation Order refers to both electric lighting and gas. In the first clause, it is proposed that, subject to the Dundee Electric Lighting Order, 1890, the area of supply as extended by the Dundee Corporation Act, 1897, within which the Dundee Gas Commissioners as the undertakers for the purposes of the 1890 Order, are authorized to supply electrical energy, shall be extended to embrace the district annexed, and so much of the district surrounding the burgh as lies within a radius of 700 yards—being the municipal and police boundaries as extended by this Order. A provision excludes any part of Broughty Ferry except by agreement. The next clause debars the Gas Commissioners from breaking up or interfering with any streets not repairable by the local authority or any railway or tramway within the extended area of supply without the consent of the authority, company, or person by whom such street, railway, or tramway is repairable, or of the Board of Trade. An electricity stand-by clause appears. It is further proposed that the Gas Commissioners may charge for gas supplied by them in the annexed district 1s. per 1000 cubic feet in addition to, or in excess of, the price for the time being charged by them for gas supplied for the same purposes within the existing burgh. The last clause in this part of the Order is to confer power upon the Commissioners to inspect gas-fittings in new buildings. [*Parliamentary Agents: Messrs. W. Robertson and Co.*]

The Glasgow Corporation also seek to have certain provisions of their Gas Acts repealed, and others substituted which will have the effect of prescribing 16-candle gas, tested by the Metropolitan argand burner No. 2, the bar photometer, and the Harcourt ten-candle pentane lamp. [*Parliamentary Agents: Messrs. Martin and Leslie.*]

WATER BILLS FOR 1907.

IN the two preceding issues of the "JOURNAL," we have noticed the principal features of the Gas Bills for the coming session. We now deal with those relating to the supply of water—taking first the measures promoted by Companies.

The Colne Valley Water Bill is to enable the Colne Valley Water Company to raise additional capital to an amount not exceeding £240,000 by shares or stock, the former to be of not less nominal value than £10, and the dividend to be limited to 7 per cent. if the capital is issued as ordinary, and to 4 per cent. if as preference. The new capital is to be offered by auction or tender; and it is to be one of the conditions that the full price, including premium, is to be paid within three months after the sale. Shares or stock not sold may be offered to the shareholders, employees, or consumers. The Company ask for power to borrow to the extent of one-fourth of the amount of additional capital authorized, and also to create and issue debenture stock, which is to rank *pari passu* with that now existing. Authority is sought to grant pensions and retiring or superannuation allowances to officers and servants, as well as to erect, fit up, and maintain cottages for them. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Great Yarmouth Water-Works and Lowestoft Water and Gas Bill is practically the measure which the promoters were unsuccessful in carrying through the two Houses last session. It is to authorize the construction of additional works, and the taking of water from the River Bure, for the purpose of affording increased supplies by the Great Yarmouth Water Company and the Lowestoft Water and Gas Company, and to confer further powers upon them. The new works are to consist of an intake on the above-named river in the parish of Horning, a line of pipes connecting it with a subsiding reservoir in the parish of Ormesby St. Michael, a pumping-station near the intake, and another pipeline from the reservoir to the pumping-station of the Great Yarmouth Company. The water is not to be drawn from any other part of the river than the point of intake; nor is it to be taken for the purpose of supply if it contains more than 20 grains of chlorine per gallon. Contravention of this provision will render the Great Yarmouth Company liable to a penalty of £10 a day. No water taken from the Bure is to be distributed unless it has been drawn from subsiding reservoirs having a total capacity equivalent to not less than five times the maximum quantity abstracted in any one day. A period of three years is asked for the purchase of lands, and seven years for the completion of the new works. The Bill includes a number of provisions for the protection of the Norfolk County Council, the Great Yarmouth Port and Haven Commissioners, the Ludham Drainage Commissioners, and the Bishop of Norwich. The promoting Companies ask for authority to supply each other with water, to sell water in bulk, and the Lowestoft Company to supply it by measure. The Company ask permission to raise £120,000, and the Great Yarmouth Company £80,000, of additional capital, to be limited to 7 per cent. if issued as ordinary, and to 6 per cent. if as preference. It is to be put up to auction or tender; and any stock or shares not sold are to be offered to the shareholders. Borrowing powers to the extent of one-third of the additional capital granted are applied for, as well as authority to create debenture stock. The Great

Yarmouth Company undertake to supply water for all Government purposes on conditions to be agreed upon or determined by an arbitrator; and they will not commence works below high-water mark without the consent of the Board of Trade. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Portishead District Water Bill is to empower the Portishead District Water Company to construct additional works, consisting of a pumping-station in the parish and urban district of Portishead, a covered service reservoir in the parish of North Weston, and a line of pipes connecting them, all of which are to be completed within seven years from the passing of the Act. The Bill contains provisions for the detection and prevention of waste and pollution, the sale of water by measure, and its supply to houses partly used for trade. The term "a supply of water for domestic purposes" is clearly defined in the Bill. Power is sought to raise additional capital to the amount of £24,000, carrying 7 or 5 per cent. dividend according as it is issued as ordinary or preference. It is to be put up to auction or tender, and any not sold is to be offered to the stockholders, employees, or consumers. Borrowing powers to the extent of one-third of the additional capital are required, as well as authority to create debenture stock. [*Parliamentary Agents: Messrs. Batten, Proffitt, and Scott.*]

The Selsey Water and Gas Bill, which is to incorporate the Selsey Water and Gas Company, and to enable them to supply gas and water in certain parishes in the county of Sussex, has already been noticed so far as the gas clauses are concerned. The capital proposed is £24,000, in £10 shares, with borrowing powers not exceeding £8000. The Company apply for authority to construct a well and pumping-station in the parish of North Mundham, and a conduit or line of pipes commencing there and terminating in the road leading from Fisher Common to the Chichester and Arundel Canal, to be completed in three years. The limits for the supply of water are the parishes of Selsey, Sidlesham, Pagham, North Mundham, and Hunston, all in the county of Sussex. Part of the Chichester Water Act, 1897, including the first two and the last of the above-named places within the Corporation limits, is to be repealed. The charges for water for domestic purposes are to be based on the rateable value of the premises; and where the supply is by meter, the maximum rate is to be 2s. per 1000 gallons. The usual provisions are made for sale of water in bulk, for making bye-laws for the prevention of waste, supplying materials, and removing meters, fittings, &c. [*Parliamentary Agents: Messrs. Baker and Co.*]

The South Lincolnshire Water Bill is to extend the limits of supply of the South Lincolnshire Water Company, as defined by the Act of last session, so as to include the portion of the parish of Deeping St. Nicholas not already comprised within them, as well as other parishes and places in the county of Lincoln. Should the Bill pass, all the powers of the Spalding Urban District Council in regard to the supply of water within the parishes of Bourne, Deeping St. Nicholas, and Pinchbeck will cease, and the portion of section 4 of the Spalding Water Act, 1900, relating to these parishes will be repealed. Confirmation is sought of an agreement for the purchase of the undertaking of the Fen Water Company. The capital specified in the 1906 Act (£30,000) is to be increased to £45,000, in £5 shares; and the borrowing powers, from £10,000 to £15,000. The additional capital may be raised by ordinary or preference shares or stock; but the holders are not to be entitled to a preferred interest of more than 6 per cent. per annum. The Bill contains some important provisions regulating the construction and use of boreholes and wells; and no one is to be allowed to sink them in positions calculated to prejudicially affect the water sources of the Company. Anyone offending against these provisions is to be liable to a penalty not exceeding £5; and, in the case of a continuing offence, to a further penalty not exceeding 40s. a day, after written notice of the offence has been received by the parties concerned. The Bill puts some important restrictions upon the removal of water from within the Company's limits of supply, except with the express authority of Parliament. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Southend Water Bill is to confer further powers upon the Southend Water Company, extend their limits of supply, authorize the transfer to them of the water undertakings of the Leigh-on-Sea Urban District Council and the Billericay Rural District Council, and sanction the raising of additional capital. The extended limits will include the parish and urban district of Leigh-on-Sea, a number of parishes in the rural district of Billericay, and Langdon Hills and Fobbing in the rural district of Orsett, all in the county of Essex. The undertaking to be transferred consists of a well and pumping-station, machinery and fittings, and reservoirs, with the land and appurtenances belonging thereto or held therewith, and the mains, pipes, and other plant, stock, and effects of the District Council connected with the supply of water; and the price to be paid for it is £14,415 12s. 7d. Certain wells specified are to be retained by the Council. All mains laid or machinery fixed since Aug. 1, 1906, with the approval of the Company's Managing-Director are to be paid for in addition. The Company take over the loan indebtedness of the Council in respect of the water undertaking. The property of the Rural District Council consists of about an acre of land, with the boring and the buildings, machinery, and fittings upon it; and the Company will pay £2300 for the whole. The Council, however, are to have the option of retaining any rights now possessed by them, under agreements with the Company, for the supply of water in bulk to certain parishes named in the Bill. Provision is made for securing the water from the boring for use primarily within the Council's district; and the quantities to be guaranteed per day per head of the population are specified. The Council are to pay at the rate of 1s. 6d. per 1000 gallons for the water they require, and an annual rent of 30s. for each meter supplied by the Company. Authority is required for raising additional capital to the amount (including premium) of £250,000, in £10 shares, and carrying a maximum dividend of 5 per cent. per annum, whether issued as ordinary or as preference capital. It is, of course, to be put up to auction or tender, and any not sold is to be offered to the shareholders. Borrowing powers to the extent of one-third of the additional capital authorized are applied for, as well as permission to create debenture stock. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Wisbech Water Bill is to extend the limits of supply of the Wisbech Water Company, so as to include about twenty parishes in the county of Norfolk and half-a-dozen in the Isle of Ely, and to authorize the construction of an aqueduct, conduit, or pipe-line from one boundary of the Company's present area of supply to another. Permission is sought to raise additional capital to the amount, including premium, of £30,000, to be sold by auction or tender, and any not disposed of in this way may be offered to the holders of the ordinary shares or stock or to the employees of the Company. The additional capital is to carry 7 per cent. dividend if issued as ordinary, or 6 per cent. if as preference; and borrowing powers to the extent of one-third are sought in respect of it. [*Parliamentary Agents: Messrs. Dyson and Co.*]

OPEN VENTILATORS IN RETORT-HOUSE ROOFS.

In connection with a description published in the "Journal" on Jan. 1, of the large retort-house at the works of the South Suburban Gas Company, a question has been raised as to what was meant by the sentence: "It will be remarked that it [the roof] is quite a simple structure, with an open ventilator along the top, after the manner of the first retort-house put up by Mr. Edward Drory at the Mariendorf (Berlin) works." What was intended by the use of the words "open ventilator" here is an open space—4 feet wide—running the full length of the house, at the ridge of the roof, without covering of any kind, but free to the heavens; and in referring to this clear space being a form of construction "after the manner of the first retort-house" put up at Mariendorf, it was not by any means a suggestion that this was the *first* retort-house that had had free space in the roof provided for ventilation. As a matter of fact, this first retort-house at Mariendorf was only built in 1900-1; and seven years before that Mr. Drory had shown the same form of construction in his design for a retort-house at Vienna. Of course, Mr. Drory did more than provide open ventilators in these houses. The one at Mariendorf contains double benches, in parallel; and there is between them a clear space from the ground level up to the open ventilator. Before Vienna, too, there had been open ventilators in England for many years; but their original introduction was no doubt more by accidental circumstance than design. But thirty or forty years ago, there was not such a careful published record of engineering work and details in the gas industry, as at the present time. Work was dealt with generally and not individually or particularly; and so for much that is of historical interest, we have to depend upon men's recollections.

However, it has been said above that possibly the open ventilator came about more by accident than design. If this is not right, then perhaps those who have any evidence to the contrary will advance it for the sake of interest. Retort-house roofs were at one time made with lantern tops, with louvres at the sides of the lanterns. The slates were fastened to the iron battens, with copper or lead pins or wires. The former corroded; and the latter would not hold firmly. [Afterwards wood was fixed to the iron, and the slates nailed to it.] The result was that periodically storms would blow off a large proportion of the slates, especially from the lanterns, and at length, instead of replacing the slates after a storm, the remainder were, in some cases, taken off, as the shortest cut out of the difficulty. This was found so satisfactory that, in instances within knowledge, the entire lantern was removed, and a corrugated iron open ventilator substituted. Since then retort-houses have frequently been built with open ventilators—in fact, we believe there are two houses in London, erected in the sixties, still standing, with open ventilators. This, anyway, is the story of how the open ventilator came to be adopted as a feature of retort-house construction in the case of one London Company. Mariendorf, Plymouth, Lower Sydenham, and certain other places show that the principle of the open ventilator is being continued in modern retort-house construction, though far from universally—notwithstanding economy and satisfactory experience. Of course, in modern retort-houses there is greater need for adequate ventilation—with the higher heats now worked, the greater amount of coal dealt with on a given area, the heavier charges carbonized, and the greater masses of incandescent spent material expelled from the retorts—than under the less stringent conditions of other days; but the interpretation of the term "adequate" must not be too liberal, so as to lead to excess. For excessive ventilation in a retort-house is, just as is insufficient ventilation, a mistake.

THE FUTURE OF VERTICAL RETORTS.

A paper was read last September by Herr Eisele, of Cassel, before the meeting of the Mid-Rhenish Association of Gas and Water Engineers, which was held at Bruchsal, on the "Vertical Retort in Relation to the Future of Gas Manufacture." The paper was only published in the "Journal für Gasbeleuchtung" of the 5th inst.; and from this source the following abstract of its contents has been translated.

In 1903, the late Herr Merz, of Cassel, delivered the Presidential Address to the Mid-Rhenish Association; but its publication was deferred until after his death in February, 1904. In due course, a summary of the address—in which he discussed the trend of invention in retorts and settings, was given in the "JOURNAL" (see Vol. LXXXV., p. 770). Herr Eisele referred appreciatively to the foresight which his late colleague displayed in that address; and, in regard to the comments on carbonization in large chamber ovens and vertical retorts, he mentioned that Herr Merz had himself tried a setting at Cassel which was intermediate between a chamber oven and a retort. With this setting (which was still at work), the yield of gas per ton of coal and per square foot of ground-space was smaller than with ordinary retorts; but the coke obtained was better, harder, and denser. In the discussion on Herr Merz's paper, most speakers considered that economy of space was the chief purpose and utility of the vertical retort; but Herr Eisele had then expressed the view that the main advantages and object of the vertical retort would rather be that the setting would be simpler and more rational in construction, and that the material would be naturally or automatically passed through the carbonizing chamber. The inclined retort represented a transition stage. This view was, he thought, endorsed by what had already taken place in the development of the vertical retort, to three existing systems of which—the Dessau, the Settle-Padfield, and the Woodall-Duckham—he proceeded to refer. The vertical retort, in addition to the advantage of more natural construction and operation, promised, he said, to afford, as compared with horizontal and inclined retorts, a larger yield of gas and ammonia, better coke and tar, and gas poorer in naphthalene. There was a reduction in the labour required, and eventually perhaps they might hope for continuous carbonization with addition of water gas, and withdrawal of the coke ready quenched and cold. These advantages, however, had so far been only partially secured; but they were so worthy of pursuit that the further development of the vertical retort should be pushed on with the greatest energy. The inventors of existing types were apt to overrate their advantages and underrate their faults and the advantages of others. An impartial review of what had been done so far should, therefore, be profitable, especially if stress were laid upon the more significant features and achievements of each type.

Herr Eisele then described the following types of vertical retorts, which are familiar to most English gas men from the descriptions which have appeared in the "JOURNAL," which Herr Eisele names as the source of his information in many cases.

He dealt first with the Dessau vertical retort, of which he spoke favourably, though he considered that the method of closing the bottom of the retort was unsatisfactory. Though the Dessau retort constituted a marked advance, it could not be supposed that finality in development had been reached with it; for it embodied periodic charging and discharging, with their disagreeable consequences, such as the evolution of smoke and vapour, incommoding the workmen by heat and bad air, and endangering them by the rush of coke. A continuous carbonizing process should ultimately be found which would get rid of these evils. Herr Eisele next referred to the Settle-Padfield vertical retort, which had, he said, the advantage of continuous charging; but the discharging was effected periodically in a manner that suggested a combination of a vertical with an inclined retort. The charging apparatus, moreover, did not appear happily chosen for dealing with a material like coal. Another setting was the Woodall-Duckham, in which continuous carbonization was aimed at. How far these two English settings achieved their aims it was impossible to say from the few results which, to Herr Eisele's knowledge, had been published; but the charging and discharging arrangements seemed to him not well conceived. The English people seemed enthusiastic over the settings of their countrymen, and much opposed to the Dessau setting. It was, however, unsatisfactory to pronounce judgment until further working results had been published.

Vertical retorts had also been constructed by Rummens and by Lachomette in France; but they resembled the Dessau type, and had no characteristic novelties. Verdier and Teulon, of Marseilles, had designed one for continuous carbonization; but the hollow rotatory valves by which the coal was inserted and the coke removed seemed highly unsuitable for the purpose. The setting of Bäker, of Budweis, had the retorts disposed in a circle; but otherwise they resembled the Dessau retort. Kämpfe Bros., of Eisenberg, had devised a vertical retort like the Settle-Padfield, but without continuous charging. This setting seemed promising, pending the design of one for continuous carbonizing. Another vertical retort-setting had been designed by Martin and Pagenstecher, of Mülheim-on-Rhine. With reference to all the settings named in this paragraph, Herr Eisele had been unable to obtain working results or full information—perhaps because even trial settings have not in many cases been put into operation.

Herr Eisele next remarked on the special attention and zeal which were being devoted in England to the vertical retort question, as instanced by the series of articles in the "JOURNAL," by Mr. William Young, Mr. W. R. Herring, and Mr. Thomas Glover. These articles he said, pointed to vertical retorts having been applied in England for forty years, but for the carbonization of Scottish oil-shale, with which the production of paraffin oil and ammonia rather than of gas was the object. Nevertheless, the vertical retorts in question might serve as valuable prototypes for vertical gas-retorts, and should be studied in this light.

Herr Eisele then proceeded to recapitulate briefly what Mr. Young had done towards developing the oil-shale retorts, and referred to the retorts which he had erected in 1872 for coal-gas manufacture for the Musselburgh Gas Company, and to the Young and Beilby "Pentland" setting of 1882. Reference was also made to Bryson's and Carpenter's improvements for removing the coke from the shale retorts, and to the retorts used in the oil-works of Saxony and Thuringia. Herr Eisele then passed on to the Herring and the Young and Glover vertical-retort designs—both of which, he remarked, were externally very similar, were simple and natural, and suggestive of the solid construction of a blast-furnace. Both aimed at continuous carbonization. Both embodied continuous charging, and approximately continuous withdrawal of the coke in a cold quenched state. The water vapour resulting from the quenching rose through the layers of incandescent coke and formed water gas therewith. The settings differed in the details of construction of the charging and discharging apparatus.

Having called attention to the features of the various existing types of vertical retorts, Herr Eisele went on to discuss which construction seemed to be the most correct and afforded the most promising results. The question was, however, he said, not yet susceptible of a direct and simple answer. But reviewing what had been done, he considered that the Settle-Padfield retort had charging apparatus of imperfect construction; while the continuous charging and intermittent discharging caused the level of the charge to vary, so that carbonization occurred under changing conditions, from which a uniform gas could not be expected. The same comment of imperfect construction applied to the charging device of the Woodall-Duckham retort, and he was not yet aware whether their latest type of coke-withdrawing apparatus answered well. The carbonizing conditions, however, compared favourably with those of the Dessau retort, as they remained constant, instead of changing periodically as with the latter. The quenching of the coke within the setting, and the addition of the steam thereby evolved, were favourable to higher yields of gas and ammonia with the Woodall-Duckham retort. The Dessau retort, however, had so far been more fully tested than others, and was being extensively adopted. It had the advantage that the retorts were readily accessible both at the top and at the bottom, and were easily controlled. The retorts of Herring and of Young and Glover were very interesting; but practical trials were wanted. They embodied many of the points which he (Herr Eisele) regarded as essential in an ideal vertical retort. It had been contended that the production of water gas concurrently in the vertical retort would render the residual coke less valuable, because a part of the carbon would have been abstracted in the form of carbonic oxide, while the whole of the ash remained—thus increasing the proportion of ash in the residual coke. This contention, however, was not well founded, as only about 2 lbs. of water vapour resulted from the quenching of 100 lbs. of coke; and this would oxidize less than 1 lb. of carbon. Probably at least as much carbon was oxidized when ordinary gas-retorts were drawn. Opponents of the vertical retort had further argued that the retorts would soften under the heat to which they were exposed, and would be distorted by the internal pressure of the coal. Nevertheless, in fact, they appeared to last better than horizontal or inclined retorts. It was, however, remarkable that the gases in passing through the layers of coal in the vertical retort were less readily decomposed than in the coke-oven, which worked under similar conditions and only yielded a poorer gas. The usual explanation was that the gas in the vertical retort rose upwards through the interior of the coke and coal, and did not come in contact with the hot walls. This explanation, however, did not appear wholly satisfactory.

Reviewing what had been done so far, the following facts appeared to have been established:—

1.—Gasification in vertical retorts was possible, and would be more advantageous than in horizontal and inclined retorts.
2.—The durability of the retorts, their reliability in operation, and lightening of work, and better carbonizing results had been established beyond contradiction, more especially in the case of the Dessau retort.
3.—In order to convert the nitrogen of the coal into the more valuable form of ammonia, steam must be introduced into the gas-making retorts, and the maximum yield of ammonia would be attained by increasing the quantity of steam as the temperature of carbonization rose.
4.—A larger addition of steam increased the yield of gas, but diminished the calorific power of the gas, which should not be allowed to fall below 5000 calories per cubic metre (562 B.Th.U. per cubic foot), and to a certain extent the quality of the coke.
5.—If only the steam resulting from the quenching of the coke were introduced into the retorts, the quality of the coke was scarcely affected.

These facts opened before gas men a vista of a better, more economical, simpler, and less exacting style of gas manufacture in the future. The Dessau retort had achieved much; but later greater perfection was to be expected in the attainment of continuous carbonization, a more permanent construction, an increased yield of gas, and less exacting working conditions, due to the suppression of smoke, vapour, and oppressive heat. The future of gas manufacture was assigned neither to the horizontal nor the inclined retort, nor to the coke-oven, but to the vertical retort, with the ideal continuous carbonization.

ANOTHER USEFUL COAL-TAR PRODUCT.

Tracing Water by Fluorescein.

Among the papers on the subject of "Underground Water" published by the United States Geological Survey in the past year was one by Mr. R. B. Dole, in the course of which a material called "Fluoresceïn" was stated to have proved superior to everything else tried for tracing the flow of large or small underground streams through well-defined channels in rocks, especially in calcareous formations. From an abstract of the paper given in "Engineering Record," it appears that fluoresceïn is a coal-tar product, and occurs as a crystalline powder or in amorphous masses, varying in colour from reddish yellow to dark brown. In the presence of alkalies, its solution is red by transmitted light and bright green by reflected light—a phenomenon known as green fluorescence. For a flow indicator it is important to use fluoresceïn of good quality, as otherwise the coloration will not be visible in a solution sufficiently dilute. The most practical test of the applicability of a sample of fluoresceïn seems to be that it should be apparent with the fluoroscope in a dilution of 1 part in 10,000 million parts of water. If any weaker material is used, a larger quantity is, of course, necessary. In its perfected form, the fluoroscope consists of twelve tubes of pure white glass of even bore, each 950 mm. long and about 15 mm. in diameter. Each tube is closed at its lower end by a rubber stopper blackened with powdered plumbago. A rack is provided in which the tubes are held side by side in a vertical position. When they are filled with samples, the presence of fluoresceïn is recognized by the appearance, projected on the black cork, of a greenish reflection which is entirely different from the natural tint of the water. It is often convenient to use for comparison standard tubes containing dilutions varying from 0 to 0·002 part per million. The limit of visibility depends greatly on the nature of the fluoresceïn used. It has been placed at 1 part in 10,000 million parts of clear water; but for practical demonstration 5 parts in that quantity is better. The limit of visibility with the naked eye seems to be 250 parts per 10,000 millions. By comparison with tubes of known content, the amount of fluoresceïn in the samples may be estimated; and with this and other data the seepage from one water-bearing stratum to another may be determined.

Fluoresceïn can be poured down where there is expected to be a connection with the underground flow—in general at any point of higher elevation than the water level in the bed under study. Sink holes, cesspools, temporary borings, or the beds of degravelling streams are all desirable places to introduce the dye. If it is poured down where there is no considerable flow of water towards the lower strata—such as in a dry boring or vault—enough water should be thrown upon it to wash it down. The quantity of fluoresceïn to be used varies with the distance travelled, the time of the journey, the size of the sheet of water, and the nature of the material traversed. The amount generally employed is between ½ lb. and 2 lbs., though experiments have been made with much greater weights. In general, the quantity is 2 lbs. of fluoresceïn per hour for a flow of about 31,700 gallons per minute from the bed. It is, of course, necessary to add enough to produce a detectable coloration in the water of the well or spring under examination. Having determined the flow of the latter, an approximation may be made of the amount of fluoresceïn necessary to ensure the presence of a visible quantity in the effluent. Since, however, all the water of the underground bed will probably not be delivered at the points of examination, the amount of fluoresceïn should be increased with the distance travelled.

Fluoresceïn has been extensively used by the authorities of Paris in the study of springs from which the greater part of the drinking water is taken. An especially noteworthy experiment was conducted at Auxerre to demonstrate the passage of polluted water from a ditch, through alluvial deposits of sand and gravel, into a collecting gallery from which the city supply was taken. An account of this experiment, prepared from a paper by M. le Couppey de la Forest, illustrates the method of drawing certain conclusions from the test results. A collecting gallery, about 300 feet long, in the alluvium of the Yonne is situated from 130 to 230 feet from the river. Its top is 2 ft. 9 in., and its water plane 4 ft. 4 in., below the surface. A polluted brook ran directly towards the collecting gallery till within 28 feet of it, then turned nearly at a right angle, and paralleled it at about the same distance. Its water surface was from 1 ft. 2 in. to 3 ft. 6 in. above that of the gallery, from which 1,130,000 gallons of water were pumped daily. One kilogramme (2·2 lbs.) of fluoresceïn was put into the brook 254 feet in a straight line from the collecting galleries, and samples were then taken of the water pumped from the galleries. Fluoresceïn was shown 2¼ hours after the dye was put into the brook; and an intense coloration was clearly visible to the naked eye in about 10 hours, lasting for 13 hours. By examining samples from many sources throughout the city, and estimating the amount of fluoresceïn present, it was found that the city water was coloured for 13 hours at an average of 1 part of fluoresceïn in 30 million parts. During this period about 600,000 gallons were pumped from the galleries, containing, therefore, 0·17 lb. of fluoresceïn. Since 2·2 lbs. were put into the brook and 0·17 lb. reached the city water, it may be estimated that the ditch water reached the galleries in the proportion of 2·2 : 0·17; or, to allow for some small error, about 1-15th of the brook water infiltrated to the city supply. As previously stated, it took 2¼ hours for the fluoresceïn to reach the filter galleries. Assuming that the infiltration extended from the point at which the material was put down, the colouring matter would have progressed at the rate of 113 feet an hour through the alluvial deposits. If, on the other hand, the infiltration took place between the ditch and the gallery at the nearest point, it occurred at the rate of 12·4 feet per hour. But, assuming a maximum filtration rate of 3 million gallons per acre per day for an efficient sand filter, it may be inferred that this brook water reached the collecting galleries with practically no purification.

In the course of his paper, Mr. Dole called attention to the following points: (1) In determining the sanitary value of a well or spring, it is more important to study the underground flow than to analyze the water itself. (2) Foreign substances put into the aquifer and traced from point to point are of great use in this study. (3) With the fluoroscope, 1 part of fluoresceïn can be detected in 10,000 million parts of water; and fluoresceïn is a particularly valuable flow indicator for fissured or cavernized rocks. (5) It is also available in gravels, where it has been used with success. (6) It progresses at a slightly slower rate than the water in which it is suspended. (7) It is not decolorized by passage through sand, gravel, or manure; it is slightly decomposed by calcareous soils. (8) It is entirely decolorized by peaty formations and by free acids, except carbonic acid.

The Identity of the "Graetzin" Lamp.

In the references that have been made in our columns to the "Graetzin" inverted gas-lamp, and the results of tests with it in Vienna in comparison with other lights, it has been suggested that the lamp was unknown in this country. As a matter of fact, it is a lamp that has been sold, by certain of the wholesale houses, under other names. One correspondent informs us that he has purchased "Graetzin" lamps, under that name, from Messrs. J. & W. B. Smith, and that firm have informed us that the lamp is the one they are selling as the "Nero." Messrs. Falk, Stadelmann, and Co., Limited, have communicated the intelligence that they have for some time been dealing with the lamp as the "Vesta." Messrs. James Milne and Son have also been selling it under the title of the "Viaduct." And doubtless, if inquiries were made, it would be found that other wholesale houses were also prepared to supply the lamp under some other designation. However, with such nominal distinctions, it would not, of course, suggest itself to anyone outside those commercially handling the lamp that the "Graetzin" the "Nero," the "Vesta," and the "Viaduct" were all one and the same. Mr. Hubert Pooley, the Engineer and Manager of the Stafford Gas and Electricity Department, writing on this subject, says: "I notice in one of your valuable leaders this week mention is made of the 'Graetzin' light, and that it is unknown in this country. Might I correct you, so far, in saying that we have had 'Graetzin' lamps in use in Stafford for some weeks now. I think it would be a good suggestion if the makers or agents of new lamps could be persuaded to send advance examples to the Editors of our Technical Press; and I believe, if such a step were taken, we should find that it would promote the interests of our industry, and at the same time be of great advantage to the agent or agents of valuable lights, which might be introduced in this way." Mr. Pooley also bears testimony to the high efficiency of the lamp.

The London and Southern District Junior Gas Association are holding a meeting to-morrow, at the Cripplegate Institute, to hear a lecture by Mr. W. H. Y. Webber on "Flame Temperature in Its Practical Aspects."

The Gas Supply of Paris.—We learn from the "Journal de l'Eclairage au Gaz" that the Committee appointed to consider the tenders submitted for the future control of the gas supply of Paris have selected five as being calculated to be suitable; and they are now under examination. Pending a decision as to the one to be recommended for acceptance, the Municipal Council, notwithstanding their vote that the provisional management of the supply by the Liquidators of the Gas Company should cease at the close of the past year, have sanctioned arrangements with them for its continuance for a period "terminable in the month following the day on which the Council shall decide that it shall come to an end." A month's notice is to be given to the Liquidators of the entrance into possession by the new concessionary. It is thought at the Hôtel de Ville that the delay which will now take place in the settlement of this troublesome question will afford an opportunity for the Labour representatives on the Council to urge certain demands of the gas workers which have not hitherto been considered admissible.

VICTORIAN GAS MANAGERS' ASSOCIATION.

First Annual Meeting.

The First Annual Meeting of the Association, which was formed about a twelvemonth ago, took place in the Rooms of the Victorian Institute of Engineers, Melbourne, on November the 7th. The chair was taken by the PRESIDENT, Mr. R. O. Thompson, of Melbourne. There were 34 members in attendance.

The HON. SECRETARY (Mr. P. C. Holmes Hunt, of Melbourne) read the minutes of the formation meeting, on Nov. 8, 1905;* and Messrs. J. Bowman (Sale) and B. Lord (Maryborough) were elected Auditors.

The report of the Council having been received and adopted, the members proceeded to discuss the draft proposal of rules submitted by the Council for approval. After discussion, these were approved with one or two minor alterations.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his Inaugural Address, in the course of which he said:

On taking the chair as President of the Association at this the first annual meeting, it is hardly necessary to say how highly I appreciate the honour you have done me in placing me in the position. The members may be congratulated on the success which attended the Inaugural Meeting in November of last year, when so many representatives from the various Gas Companies in Victoria accepted the hospitable welcome extended by the Metropolitan Gas Company.

Two visits of an interesting character were made during your stay in Melbourne. The first of these was to the Metropolitan Gas Company's South Melbourne works, where we were received by the Resident Manager (Mr. Charles Howlett), one of our members, who conducted us over this extensive establishment. The gas made at these works is stored in three holders, one of 1 million cubic feet and two of upwards of 3 million feet capacity. These holders are on the non-trussed principle, with strong steel crown curbs; and they are guided when in action by lattice standards, connected by Warren girders and diagonal tie-rod bracing. Features of the works are the large and commodious meter and stove workshops, dealing with some 10,000 meters and 5000 stoves in the course of the year. The second visit was made to the Spotswood sewerage pumping-station of the Metropolitan Board of Works, where we were taken by steam launch, at the kind invitation of the Board's Superintending Engineer (Mr. Calder Oliver), who, with Mr. Smith, the Officer in Charge, explained the method of pumping the sewerage. On each of these visits we enjoyed the hospitality of our kind friends, who received us most heartily.

It is of primary importance that the Association should be strengthened by obtaining new members, and its interests advanced by the reading of papers. To prepare papers is, perhaps, not an easy matter; yet they are the mainstay of Associations such as ours. I hope the members will give their earnest attention to this subject, and also endeavour to be present at the annual meetings; thereby adding to their store of information as well by the interchange of ideas and experiences, as by the facilities for becoming known to each other and forming friendships of mutual esteem and respect. They will also be enabled, by participating in visits of inspection to large and progressive works, to increase their useful and practical knowledge.

The depression which existed in Victoria for some years after the collapse of the "boom" which had such a retarding influence on business generally, was severely felt by the Gas Companies, who were still further adversely affected by the Government adopting a change in the method of keeping meridian time, causing a loss of twenty minutes' lighting each night. The depression is now passing away; and renewed prosperity is anticipated with the opportune rains and abundant harvests.

The stores of gas coal at command—with some limit as to cost—is a question of vital importance to members of the gas profession, who have to distribute the light and heat obtained from every ton of coal distilled in the retorts. The coal area worked in Victoria does not yield a gas-making coal; and our supplies are obtained from the upper coal measures in the Newcastle district of the adjoining State of New South Wales, where fields of magnificent coal exist, divided into an upper, middle, and lower series. Some of the recognized seams in the upper measures are ideal gas coals, with less than ½ per cent. of sulphur, and rich in gas-producing qualities, with a resultant coke of the highest class. These seams are gradually becoming exhausted—one mine has already closed down—and it is satisfactory to know that several seams of valuable gas coals are being developed in the Maitland district, a little to the west of Newcastle.

The coal used in Victoria is necessarily sea-borne; and we are more or less in the hands of the shipowners with whom contracts have to be entered into. The colliery proprietors and the shipowners have recently entered into a strong combination, and announce an increase in price for all coal contracts for next year. Happily, the threatened strike of the coal miners has now been averted; and satisfaction must be expressed at the result of the conference between the colliery proprietors and the miners' delegates. Each side has gained something contended for; and we, as customers, are called upon to pay an enhanced price for our contracts. Yet we are immensely relieved at the settlement arrived at on the points in dispute, which seemed at one time likely to end in a disastrous calamity. On the last occasion of a strike—the maritime strike—gas coal had to be obtained from Queensland, Japan, and even England.

The cost, inconvenience, and alarm occasioned by the gas stokers' strikes in 1889 gave an impetus to the use of machinery for the handling of coal and coke in retort-houses; and now carbonizing in the larger works is less dependent on the workman. The West and Arrol-Foulis machines, as evidence of mechanical skill applied to the charging and drawing of retorts, have more than justified the claims advanced by their inventors, "that the distillation of coal would be performed with greater economy and with more efficiency." This supremacy is, however, now challenged by the more recent types of rotary machines designed for throwing the coal, in even layers, uniformly throughout the length of the retort. The West and Arrol-Foulis machines have been at work in Melbourne for some years; but in the small works of Victoria, where the method of charging is by the shovel, the question of machinery is of minor importance. In a few of the works a simple and expeditious method of charging with the scoop is in use, as first introduced at the South Melbourne works, where more recently an overhead traveller has been adopted for working a small number of retorts.

An installation of inclined retorts, now in process of renewal, will be inspected on your visit to the West Melbourne Gas-Works. The vertical retort has not yet arrived; but it is thought by the more optimistic of gas engineers that this will be the retort of the future. I had the privilege of seeing both the Settle-Padfield and the Woodall-Duckham systems when in England, and formed the opinion that, however suited for small installations, there was yet much to be done before venturing the system of vertical retorts on a large scale. The question of the best number of retorts to be set in a bed is one of convenience, and personal predilection, and may be left to individual judgment and experience. There can, however, be no two opinions as to the advantages to be derived from the regenerative system of heating retorts, where it can be applied, whatever the number in a bed; and neither stoking machines nor inclined retorts would be so successful were it not for the uniform heats rendered possible by regenerative furnaces.

In purification, after the condensable vapours have been parted with in the condensers and washers, and the scrubbers have efficiently done their work in eliminating ammonia, as well as in partially removing carbonic acid and sulphur, the cycle of operations is completed in the purifiers, which, in order to reduce the speed and pressure of the gas, should be ample in superficial area. The cost of purifying material need not be a large item, with a minimum of sulphuretted hydrogen contained in the gas, and abundant deposits of iron oxide at disposal.

We are not yet in a position to commercially recover the products from the spent oxide, or those to be obtained by the redistillation, or fractional distillation, of the tar. The cost of labour, fuel, &c., and a limited demand, determines the chemical manufacturer to import, rather than locally recover, the constituents to be obtained by the manipulation of the spent oxide, or those of greater value derivable from the more complex mixtures of tar. An outlet for the residual tar has existed for years in the making and maintenance of roads; and the sulphate of ammonia manufactured is exported at remunerative rates, notwithstanding that the cost of production is high from causes already mentioned.

The State legislation during the past year touching the gas industry was in the first instance the clauses in the Electric Tramway Bill safeguarding the pipes from the danger of electrolysis, and "that the electric light should not be supplied beyond a certain distance from the tram-rails." The second instance was the Boiler Inspection Bill—a measure to be welcomed in the interests of safety to human life and property. Boiler attendants must be provided with certificates of competency, and boilers must be kept in the best possible order, ready for a visit from the Government Inspector at any time.

The distribution of gas requires increased intelligence and attention on the part of those responsible for the full and sufficient supply, necessary to meet the ever-increasing demands of gas-stoves, prepayment grillers, and the heating and power business, which involve the pressures being kept up in the day time. It has now become a distinct necessity that incandescent burners, mantles, pendants, and all other accessories for the development of gas should be kept in stock, and the commercial side of gas-fitting cultivated by gas companies on lines similar to our pushing competitors, the electric light and oil. The fragile nature of the Welsbach mantle is such that it should be in the hands of an expert, for cleaning and renewal purposes; and a system of maintenance is advisable to give satisfaction, and keep in close touch with the consumers, who are generally pleased when a little attention is paid to them. The advantage of the incandescent gas-light is becoming more and more recognized; and it has now

* See "JOURNAL," Vol. XCIII., p. 163.

obtained a permanent position in the lighting of streets and open places. This is acknowledged by the electricians—especially with high-pressure lamps.

In reference to the educational outlook in this State of the future gas engineer or manager, who should have a sound practical education and a good mechanical knowledge to enable him to deal with a varied body of workmen, the University requires that the intending student must have matriculated; and its more elaborate education may not be within the reach of everyone. But an equally good, though not so extensive, education is provided at the Working Men's College and at the various Schools of Mines, where there are appliances and laboratories properly equipped for the teaching of practical science. There is no reason, therefore, why we should not soon have our gas engineers, managers, chemists, and officers trained in our midst, so long as we get the right kind of students.

Mr. G. Swinburne (the Minister for Agriculture and the Managing-Director of the Colonial Gas Association) said he had much pleasure in proposing a vote of thanks to the President for the address he had given to the Association. They all knew that Mr. Thompson was one of the veterans of the gas industry of Victoria—or, indeed, Australia; and they were very glad indeed to have him as first President of the Association. He had spoken on many important matters in connection with their business, and one in particular which would affect most of the gas managers—that was the increase in the price of coal. He was sure they would all begin to feel this, not only as Managers, but as Directors. He only hoped the consumer would feel it also; for very often a rise in prices had ultimately to be paid by him. It was a difficult matter, when a few shillings per ton were added to the price of coal, to supply gas at the same rate, pay the same dividends, and make everybody satisfied. If the colliery people stood to make a loss, they saw that someone had to pay for it; but with the increased facilities they had, and better ideas to bring to bear upon their work, they hoped to be able to make up the difference without touching the consumer. Increased consumption would help them. The President had also touched upon another very important matter, and that was education. He sometimes thought that the Association might be used educationally for the benefit of the members and of those who might be their gas managers in the future. It was very hard for members, spread about as they were in isolated towns throughout the State, having very little communication with each other, and depending for information altogether on the gas papers that they had from England, to keep up to date. They had a great deal of responsibility; and the more the Association could help in educating them, the more it would fulfil its functions. There were no other means that he knew of for training gas managers than gas-works. Most of their works were small, and the managers of small works had to be all-round men—business men, plumbers, stokers, &c. There were very few businesses where a man had to do so much as the manager of a small gas-works. He must know everything connected with his business, or he was not of much account.

Mr. Figgis (Ballarat) seconded the motion. As Mr. Swinburne had mentioned, Mr. Thompson had touched on a great many points of interest. Their first consideration was, of course, the rise that was coming in the price of coal. But there were other points in the address which they might think over. He quite agreed with what Mr. Swinburne had said regarding the need of facilities for the education of gas managers.

Mr. Fulton (a Director of the Colac Gas Company) supported the motion. The reason he was present to give countenance to the conference by his Board was because of the strong desire they had that something should be done by country gas managers to educate themselves, and keep in advance of current thought in regard to the production and distribution of gas. It was absolutely necessary, in this progressive age, to keep gas companies up to what they ought to be; and he looked forward with considerable hope to the future, in view of the benefits that were likely to result from the formation of the Association.

The motion having been carried with applause,

The President thanked the members for their hearty vote. He said his year of office had been a very easy one, as he had been effectively assisted by the Secretary (Mr. Hunt). So far as his address was concerned, he did not intend to give them more than a short account of what was going on.

The reading and discussion of papers was then proceeded with. The first was by Mr. R. Bearup (Hamilton), in whose absence it was read by the Hon. Secretary. Its subject was

WHAT SMALL GAS COMPANIES HAVE TO MEET.

The thought that some of my fellow managers are watching what will be the result of electric opposition on a gas-works in a place like Hamilton, has led me to give a record of my own experience in the last year or so. Hamilton is a comparatively small town; the population at the last census being only 4170. Perhaps to-day it is 5000; and it is increasing. Yet I know of no other place so small where both Gas and Electric Companies are running. A gas-works was built here by Mr. Thos. Bowman, sen., and opened in May, 1878; the Company having in those 28½ years passed successfully along, and having during the last 20 years that I have been there never paid the shareholders less than 8 per cent. per annum—sometimes more. To-day we are opposed by a local Electric Company; and a record of how these companies are being started in small towns may help some of my comrades in the gas industry to decide how best they might meet the difficulty, or whether they should embrace the opportunity, when it arrives, and run the gas and electric business under one management.

There are several gentlemen in Victoria, some of whom have been employees in electric companies, who are now doing the country towns which at present have no electric companies—trying to get municipal councils or local companies to go in for electric lighting, and offering to supply and erect plant to do the work, and run it for a few weeks, for a given sum. The average councillor looks upon gas as old-fashioned and electricity as up-to-date, as our local Council not long ago advertised in the Sydney and Melbourne papers: "Tenders for Lighting Streets of Hamilton, Gas Excepted." In some half-a-dozen small towns in Victoria endeavours are being made to float electric companies. I believe these travelling electricians are agents for some particular firms who supply engines, dynamos, cables, lamps, &c. Before an electric company can start, there must be a poll of the ratepayers; and a majority vote will give them permission to commence operations. What body of ratepayers would go against the spending of money and the erection of plant? So they vote for it, as our people did—254 for, 22 against.

In Hamilton, a local Electric Company was formed by these gentlemen two years ago; and a start to light up was made in November, 1905. A 26-H.P. oil-engine was used for driving the dynamo. Every now and again something went wrong, and the lights would go out; these failures being incidental, so the newspapers would say, to all new things. Then another oil-engine was added, so that No. 2 could be started while No. 1 was being repaired. Before No. 2 oil-engine arrived, I tried to recommend a Crossley gas-engine for reliability; but it was no use, as the Electric Company wanted me to quote gas at Melbourne price. Up to the present our opposition runs from dark to midnight; but at their last meeting, the Company decided to instal a storage battery, so that customers can have a continuous supply.

As to prices for current, which is almost all contract, the first customers obtained 16-candle lamps, from dark to midnight, at £1 per lamp per annum. I should say this is not a paying rate, if the lamps are used much. Some of the recently added places have to pay a much higher rate, and are finding out they are paying more than they formerly did for gas. The Borough Council have accepted a contract for three years for five 1000-candle power arc lamps, at the five principal corners, at £10 per annum per light and £1 per year hire for each lamp.

What took on with the electric customers we first lost was a fixed amount each month for their accounts—summer and winter—irrespective of how much current was used between dark and midnight. To try and meet this, I made contracts with twelve places where a fair amount of gas was used (five being hotels) for one year, at a fixed monthly sum; but I found that in several cases an extravagant consumption immediately took place, so that an open contract in their cases cannot be renewed at the same rate again. In some other instances a year's contract has been arranged—so much gas for so much money (which is fair), taking a year's consumption and dividing by twelve and giving a discount, making the monthly payments equal. Should they increase their consumption, we allow it at the lowest, or gas-engine, rate; and this is the only sort of contract we are likely to adopt in future, though if our opponents charged by meter we should be on a more equal footing. The advantage the Electric Company have had so far in regard to contracts has been that they cease to run their machinery after 12 p.m.; so that they know the hours the light is used.

The Gas Company, so far, have lost 28 places—some wholly, some partly. This is just 10 per cent. of our number of meters out; and as some half-dozen or more of the electric shareholders are still using gas, they may leave in time. To a small Company like ours, when several leading hotels and business places which used gas every night, cease to do so, it is noticed and felt. However, I have, by offering free services and shilling slot-meters, and fitting up places just so as to clear expenses, added more services than I have lost, though the added ones are not so important as the customers who have gone over to electricity. But they have taken shares, many of them, and so feel compelled to support their own Company.

Our gas consumption has been on the increase all this year, though a great deal of the increase is on the open-contract customers. With an opposition Company to work against you, grumblers are not slow to exact all sorts of attentions. In towns such as Hamilton, with firewood retailed at 5s. per ton in the summer, and 6s. in winter, there is not much gas used for cooking—mainly a few boiling-rings.

It may be asked: How does the Electric Company pay at Hamilton? Well, it has only been running a year; and it is too early yet to say. Their half-year's balance-sheet from January to June showed a debit balance of £386. Oil cost £98; and wages and salaries, £182; while receipts from lighting were £66. But their next half-year's result should be much better, as many of the best customers only came on towards the close of the half year, and the borough lighting since. The Directors state that they are now paying their way.

If it be not presumption on my part to offer any advice to managers who are situated in towns the size of Hamilton, let me recommend that, if the opposition of electric lighting by a local

company be seriously entertained and likely to be gone on with, the better plan would be for the gas company to embrace the opportunity and run the two; for if they are to be successful, it should surely be by the running of the two concerns under one management. The gas-works would, by supplying gas to engines to generate electricity (unless a producer was installed), have a good customer in the power required for the opposing light. Then the more electricity used, the more gas would the engine consume. Thus, while some good customers might go over to electric lighting, they would not be altogether lost to the Company.

Another great recommendation for this amalgamation of the rival lights is the question of price. With two opposing Companies in a small place, cutting goes on for custom that is often below the margin of a fair price for the work required. Under the single management of the two rivals, a price could be quoted for contracts that would be paying, and would yield a decent living wage for all concerned. Municipally-owned gas-works are in a far better position to deal with electric companies trying to start against the corporation gas-works than gas companies are. The control of the streets is in the Council's hands, and they can decline the use of them to erect poles; and they would keep the street lighting in their own hands, for the sake of their gas-works.

Discussion.

The PRESIDENT said that, as a matter of fact, the manufacturers of electric lighting machinery, dynamos, &c., in the Home Country sent their agents out all over the world to find towns in which there was any prospect of supplying electricity. These agents sent home orders regardless of local conditions or whether or not the thing would pay.

Mr. FIGGIS said it was evident Mr. Bearup was feeling the pinch of electric competition; but he (Mr. Figgis) must say he wholly disagreed with the conclusions the writer had arrived at to recommend that smaller gas companies should run the electric and gas supplies under one management. He had very strong opposition in Ballarat from an electric lighting company; but he thought it was always well to take history for it. There was one small company that stood out as a beacon to all theorists in the gas profession against arriving at any such conclusion as Mr. Bearup's. The Rockhampton (Queensland) Gas Company had been supplying electricity as well as gas. They had put up plant at a cost, he understood, of from £15,000 to £20,000. This indicated that they had gone into the matter in a thoroughly businesslike way, employing a separate electrical engineer, &c. What was the result? The Company, prior to taking this step, was an exceedingly prosperous concern, and had accumulated a really good reserve fund amounting to some thousands of pounds. The result of running the electric light plant had been that the Company had made a loss every six months, which had absorbed the whole of the reserve. He believed he was right in saying that it was now "on the cards" that the Company would be giving up altogether the generation of electricity. Of course, there were certain towns where gas and electric light undertakings were run in conjunction. He might mention Perth, where the conjoined enterprises were working exceedingly successfully. There the electric lighting portion of the business paid better than the gas. But members would understand Mr. Bearup had been speaking of small companies; and it was against his conclusion regarding them that he (Mr. Figgis) was speaking. He thought it would be better if, instead of coming to that conclusion, managers of small companies would see by what means they could cheapen the production of gas. The question of dividends in face of that necessity, when there was any electric light competition, must be left out of consideration altogether. If needful, the shareholders must be educated up to the fact that they must forego their dividends if they wanted to quash the opposition. He would like to ask the members how many small electric companies paid dividends. Very few indeed when they first started. If small gas companies made up their minds that they would in every possible way, when faced with electricity competition, supply gas at the cheapest rates, he thought they would have very little to fear from it. It had now become a recognized fact that for household illumination electricity was not in the field; and if they pushed the sale for gas, they would find that they had very little to fear from electricity, whereas if they entered into the supply of this as well as of gas, neither would pay.

Mr. WARREN (Footscray) said he had several times been seriously threatened with electrical opposition; but he scarcely feared it. He almost looked upon it as welcome, because the history of electricity right through Great Britain and the Continent of Europe showed that the domestic cost was the consideration that was always to the front; and gas was cheaper than electricity, was always on hand, not dangerous, and more effective through being non-intermittent. There was one thing that a gas manager should do, and that was set to work and fit gas apparatus in people's houses for nothing, in order to get them to use gas. They laid gas in their streets very often in 10 or 12 inch pipes, found it very costly, and rated consumers with probably £10 or £20 a-piece for the expenditure. Would it not be wisdom on their part to dip their hands into their pockets a little deeper and put in the fittings? If the consumers wanted anything more elaborate than the company were prepared to supply free, they could purchase it themselves; but the companies could give them one light in the dining-room, another in the kitchen, and a small stove or griller, very cheaply to themselves. He had visited many country gas-works, from the Murray down to Melbourne, and had seen in nearly all these places that the managers used inferior coal. Why was this? It seemed to be retrograde. He had seen piles of small coal that would not yield 7000 or 8000 cubic feet of gas per ton; and these companies had to pay 7s. or 8s. a ton and railway freight for it, whereas they could get superior coal for 11s. or 12s. per ton.

Mr. BEAN (Wangaratta) said he had used small coal, but had got 11,000 cubic feet of gas per ton out of it, and much better coke than he had been able to obtain from the larger coal.

Mr. WARREN (continuing) said this was not his experience. With regard to fittings, as Mr. Figgis previously said, they must study cheapness in gas supply; and this had something to do with it. He contended that if they sent out quality in gas they would be able to fight electricity or any other form of lighting. A gentleman who was a good customer of the Metropolitan Gas Company, spending with them some £12 or £15 per annum, fixed outside his shop an arc light that cost him about £20, put out his window lights, and used electricity in his shop; but at the end of twelve months he found that, besides paying for electric light, he had to pay £10 or £12 for gas all the same, as he was using gas upstairs and in the back part of the shop. The consequence was that he did away with the electric light altogether. To fight electricity, he would advise them to keep their plant in the highest possible order, and supply the best quality gas; and the only way to get these results was to use the best coal.

Mr. G. SWINBURNE said the competition of gas with the electric light had been going on in Australia for a great many years, and he had met with it in a number of towns. Mr. Figgis had given his experience with this competition in Ballarat, Rockhampton, and Perth—proving that it varied from a great success in Perth to disastrous results in Rockhampton. At Charters Towers the gas supply was very successful, while the electric light was going to the wall. One point the members should be careful to bear in mind. He did not think they had anything to fear from electric lighting companies—they could beat them; but if they, as managers of gas companies, had to compete with municipalities who had their own electric light undertakings, they would suffer very materially, because so long as the Councils could make use of the municipal rates to keep the thing going, cover up the losses that always took place, and bring out a balance-sheet which showed a profit that could not be checked, the gas companies must in every instance suffer by losses of street lighting and some of the big consumers. The Councils were determined in such cases to make electric lighting a success by output, even if not in cash. They could supply the street-lamps at a nominal rate, and increase the lighting-rate in order to make the concern pay. The gas manager's advantage lay in always meeting them in regard to the lighting of streets. His policy would be, if threatened by municipal electric lighting, to work might and main to keep the street lighting, even if the gas had to be supplied at half price. He was mostly interested in small gas-works, excepting that he was a Director of the Melbourne Gas Company. But in Melbourne they felt the competition of the City Council most of all. They did not care a rap for the Suburban Company, as they could compete with them quite easily; but when it came to the Melbourne Corporation, it was a different manner. He had investigated the subject of electricity to see how it would pay in small towns, and had come to the conclusion that in a town like Hamilton it would be suicidal to start an electric supply. The shareholders would never get their money out of it again. It was like putting it into a bad mine. Electricity supply to small towns such as Wangaratta and Benalla would hardly pay, even without the existence of a gas company. He first came into public life in Australia simply through fighting a proposed electric lighting undertaking which the Hawthorn Council wished to enter into. He was dead-against it. He went into the political field and fought the man who was in favour of it, and beat him on the ground that an electric supply would never pay in a town unless it was a good big business centre. It was amusing to hear councillors declare how electricity would pay in such places as Wangaratta after experience with what could be done in centres like Glasgow, where there were 2 or 3 million inhabitants, instead of only 4000 or 5000 people. It was absurd. The large profits that were made by supplying electricity at places like Manchester, Sheffield, or Glasgow were due to the great industries that had to be run there with it, and the hundreds of thousands of inhabitants. They had now to be on the *qui vive* more than in the past, because electricity had come to stay, and was going to spread. Wherever they saw the slightest sign of electricity being put into operation, they should quash it by offering facilities for the use of gas. But what he rose particularly to point out was the great difference in competing with a company and with a municipal supply. If they had to compete with a municipality, they should threaten it, and meet it in every possible way; but if they had only company competition to face, they could snap their fingers at it.

[At this stage, the meeting adjourned for luncheon; and the members were hospitably entertained by the President at the Savoy Café. On resuming]

Mr. W. MORRIS (Seymour) said he agreed with Mr. Figgis in contending that Mr. Bearup was not right in saying that it would be a good thing for small towns to run the electric light with the gas supply. He thought, too, that the electric light company which had been started in Hamilton could hardly be a financial success. According to the paper, they were charging £1 per

lamp per annum. He supposed that in time the Company would have to put in meters, and then they would find that the cost would not compare at all favourably with gas. He thought it was only a matter of time before the electric light in Hamilton would be snuffed out.

Mr. BURALL (Warrnambool) said it had been suggested that, in order to combat electric lighting, shareholders in gas companies should for a time do without dividends. Unfortunately for him, they were working under statute law, and had to provide money to meet a loan raised at 7½ per cent. To some extent the loan was a protection, as the gas-works belonged to the Municipality, and the Council would rather pay a little extra for gas than see it worsted in competition. It was only by reducing the price of gas that gas companies could beat electricity.

Mr. HAWLEY (Brighton) said he happened to be Assistant Gas Manager in the town in England that was the first to be lighted by electricity; and he quite satisfied himself at the time what electric light competition was going to be, and had never troubled himself about it since. At that town the Brush Electric Light Company came along and took the street lighting contract, and carried it on for twelve months at a price a shade under what the Gas Company had been doing it for; but at the end of that time they wanted four times the amount to continue. The Council would not pay it, and the electric plant had to go. His candid opinion was that the more electric light there was the better it would be for gas companies.

Mr. HOLMES HUNT (Melbourne) said the members were very much indebted to Mr. Bearup for coming forward with his paper. At first sight he (Mr. Hunt) might take a little exception to its title, because large companies as well as small ones had to meet the special kind of competition referred to; and the bigger the Municipal Council they had to fight, the harder it would be. They in Melbourne undoubtedly felt electric light competition; but they did not object to it. Good competition was a very great safeguard to the consumer; and it also, as Mr. Hawley had said, acted as an incentive to gas people. The first thing that attracted his notice when he read the paper was the advertisement by the Hamilton Corporation. He did not know that it was really worth while speaking about, but it undoubtedly showed very great weakness on the part of the Council to publish such an advertisement, because in declining to consider the claims of gas they evidently recognized that it would give them a better service. There was no doubt at all that an electric wave, as it were, was now passing over Victoria, such as had passed over the Old Country. It was some years ago that it happened there; and there was not the faintest doubt that at the present moment the people at home were awake to the fact that, after all, gas was much better than electricity. Just before he left home, he had a conversation with the Engineer of one of the largest corporations in Europe. That gentleman had to advise on the lighting of the streets; and he had said to him (Mr. Hunt): "Every time I have to advise on the extension of lighting or the renewal of lighting in public thoroughfares, I always recommend gas, because it is more efficient and cheaper." In the meantime, it appeared to him (Mr. Hunt) that the best way to meet electric lighting opposition was the one Mr. Figgis had mentioned. If they could get the selling price of gas down, they need not fear anything from electric competition. To his mind, there was undoubtedly room for improvement in the price of gas in Victoria, although it was difficult to see how they were going to effect it straight away. When they came to look into the accounts and study the position, they would find that the high price was not owing to expensive coal, but mainly to over-capitalization. This was a thing that they could not alter. But they could try to bring down the price by extending the use of gas as far as possible, thereby increasing the consumption, and meeting all the expenses out of revenue. There was a point about the working of municipal lighting contracts that had always puzzled him. It was the custom in Melbourne and the surrounding districts to leave all gas-lamps unlighted during the full moon each month; but the electric public lamps were continued every night during the year. If municipalities wanted their thoroughfares lighted every night and all night with electricity as the illuminant, why not so with gas? Mr. Bearup had mentioned the advantages of electric lighting. He (Mr. Hunt) was not one of those men who would not admit that the electric light had all the advantages enumerated. He was quite prepared to take up the position that there was room for both gas and electric lighting on fair grounds. The distance lighting, as it was sometimes called, which could be done by pressing a button or turning a handle as one entered a room, was very convenient; but equal advantages could now be obtained with gas supply by means of a pneumatic arrangement which could be fitted in any part of the room. He was, however, looking to the electricians for a good solution of distance lighting for gas, as he felt the most reliable appliance ought to come from this source. He was very sorry to see that several inventions which he had inspected in the Old Country had not been perfected. As regards lighting public thoroughfares, he hoped that before long there would be a reliable means of lighting gas-lamps automatically. There were fixed on the lamps at home burners which were controlled as the pressure was either raised or lowered at the works. They had been trying in Melbourne an appliance which was rather different from the home one—it was an Australian invention—and they were so satisfied with the trials they had made with it that they were now going to fix it up on a larger scale. If it proved successful, perhaps when their next meeting took place he might be able to tell them more about it, and show them a larger number of installations of the apparatus than they had in immediate contemplation. So there was a chance of their being able to meet this point in the competition of the electricians by raising the pressure at the governors for a few minutes mornings and evenings, thus getting their lamps lighted and turned off without having a man running round to do it.

Mr. BEAN (Wangaratta) said he had tried a method of lighting and extinguishing lamps which was worked by alteration of pressure. It acted very well when one could regulate the pressure; but in his district there were some places where this was considerably lower at night than in the daytime. This was a difficulty which they would have to overcome in connection with distance lighting.

Mr. HOWLETT (South Melbourne) said they must all sympathize with Mr. Bearup, who undoubtedly had had, and was still having, a hard fight; but he (Mr. Howlett) was afraid Mr. Bearup was inclined to view electric light competition in a much stronger way than was necessary. If he let the consideration of the electric light slide a bit, and paid more attention to the gas he was making, he need not worry so much, and would find that he would overcome some of the difficulties. His advice was to get the consumers into such good form, in the way of being satisfied with gas, that there need be no fear of electric light competition. He thought it would be better if managers could induce their Directors to let them get their works into good order, and then get rid of all open-flame lights, and try to introduce the incandescent burners; then perhaps, while lowering their candle power, they would supply as good a light at less cost than they were doing at the present time. There was no doubt that if they could get an inflammable gas with a heating value of between 500 and 600 calories, it would far exceed that which was now being provided in any country town, if mantles were used. If they gave the people a good light, they would not have much to do with travellers who came into their town to try and ring, in electric lighting. He hoped Mr. Bearup, after hearing the remarks from his comrades, would show that, if his townspeople stuck to gas, he could give them a good light and up-to-date appliances.

Mr. MARSH (Mentone) said that, as automatic lighting had been touched upon, he might mention that he had been lighting 73 lamps automatically for twelve months. It was time-set automatic lighting; he lit them all up at one time, and they all went out together. The arrangement saved two hours every day, and they had been able to reduce their expenses by £26 a year—the wages that would have had to be paid to a lamplighter.

The PRESIDENT asked whether they had to attend to the machines every day.

Mr. MARSH replied that they had; but he said it was also necessary to look to the lamps every day, to keep them in order, clean them, or put on new mantles or chimneys. He had found it a great success.

Mr. HUNT said the point that Mr. Bean had raised about the pressure might be referred to. With the apparatus he had in mind, there was not much question about low pressure so long as one could get the high pressure. With a pressure of say 30-10ths at lighting up time and 30-10ths at turning out time, the intervening pressure did not affect the matter.

Mr. BEAN said that at sunset the pressure in part of his district went down. During the day they had 15-10ths on a particular main; but considerably before sunset this dropped—necessitating his immediately putting on further pressure at the works. He found that, when he put on 27-10ths, when he went to the main there was only 12-10ths pressure.

Mr. HUNT asked whether the main was large enough.

Mr. BEAN said it was, and it was also lower than the gas-works. This was one of the difficulties he had met with in automatic lighting.

Mr. FROST (Beechworth), referring to the subject of the paper, said he agreed with the remarks of Mr. Howlett, more especially in reference to gas managers making themselves popular with their customers. When he first went to Beechworth, they had no street lighting. The Municipal Council were opposed to gas, and a good many of the prominent residents were prejudiced against it. Their present plant was unique, so far as Australia was concerned; indeed, he did not think there was a plant like it in the world. He, however, tried to make gas as popular as possible; and at the first meeting he told his Directors he thought he could guarantee that, before another twelve months passed, they would have the town lighted. It was rather presumptuous on his part, but he managed it. In less than eight months he had 32 lamps going, and since then they had increased. There was nothing against the gas at Beechworth but prejudice. He had not one open-flame burner in the town, they were all incandescent. If there was a new thing coming round in the way of burners, they tried it. This was the only way by which they had battled against the electric light agents, who had tried on three occasions to induce the townspeople to support an electric light supply. Until the next excitement arose, they were on *terra firma*, and did not care a snap of the finger for the electric light.

Mr. BEARUP (who had joined the meeting) said he was sorry he was absent during the first portion of the discussion on his paper. Referring to the remarks of Mr. Figgis, who, he understood, said that it was much better for small gas companies to keep clear of taking on the electric light—quoting the experience of the Rockhampton Gas Company—he said that what he had stated was

news to him. He was pleased to hear that the Rockhampton Company were thinking of not further undertaking the supply of electric light through not making a success of it. This should keep them from amalgamating with electric light companies. The hours of lighting in the country towns were rather different from those in large cities. In Hamilton, they had no shops open after nine o'clock in winter. There was a weekly Wednesday half-holiday, when all the shops must close at one o'clock. In summer time all of them had to close at half-past nine, except on Saturday nights. This meant that they only had one long night's lighting in the week. Something had been said about distance lighting. This involved keeping a pilot light. In shops they would not have one—he had tried it. What induced him to suggest amalgamation was that he had a friend connected with the Perth Gas Company—a concern which undertook both gas and electric lighting, and which paid more handsomely in the electric than in the gas department. Of course, the Perth Company had everything under their own control, and could charge practically what they pleased. It was always an inducement to amalgamation that they had the prices in their own hands. So far as getting on well with the public was concerned, he (Mr. Bearup) had no enemy that he knew of in the town. But some people were not satisfied with gas, and said there was nothing like electric light. People of this sort were induced to take shares in the Electric Light Company. Some of them were leading business men; and consequently they had lost them as customers, because they at once said, "We must support our own Company." It had been suggested that they should put up some gas-lamps that would show what could be done with gas at high pressure. They ran a 750-candle lamp for two years for nothing before the Electric Light Company started. In fact, they ran three large lights for the Borough Council without charge for two years; but this did not stop them going in for electric light. The Gas Company tried hard to show the public that they could get a good light from gas; but some people thought that nothing but electric light would do. He was pleased to find his paper had given rise to a good discussion, as he did not think a paper was of any use if nothing was said about it. Most of the members differed in some way; and consequently the debate had been of some benefit.

Mr. W. W. Morris (Seymour) then read a paper on

SELLING GAS.

I have heard it said that in bygone days the manger of a gas company was not very particular as to whether he pleased or displeased a consumer; his method being, "Take it or leave it, whichever you like." This was decidedly before my day, as it is a style of which I have seen absolutely nothing. At the present time, instead of transacting business on these lines, the gas manager must actually run after the consumer, and canvass him in every possible way; using the whole of his personal influence for the good of the business he represents.

The manager of a small works has undoubtedly the advantage over his brother in the larger works, inasmuch as he is personally known to every consumer, and to many who are not consumers. He must therefore never forget to press home, on every possible occasion, the advantages of gas for lighting, motive power, and fuel, as it is a very true saying that "Constant dripping wears away even the hardest stone." He must make himself familiar with all the latest things in gas appliances, as many are caught by the novelty of a new burner, mantle, &c. He must also be able to give advice on any matter in connection with his profession, so that the intending consumer may not invest in some worthless appliance which will ever afterwards be a nuisance to himself and the manager, whom, assuredly, he will blame for supplying bad gas whenever anything is out of order.

It is to our advantage to see that the consumer is getting the full benefit from his fittings. In the matter of ordinary burners, it does undoubtedly pay to supply the best free of charge. The manager who carries a few good burners in his pocket can practically demonstrate at any time when the quality of his gas is doubted, by removing an old worn-out burner and replacing it by a good one of moderate size, that it is the method of using it, and not the gas, that is at fault.

As nowadays ordinary burners are rather the exception than the rule, I think that the time has come when we should replace mantles, or even fix incandescent burners, supplying them absolutely free of charge—at any rate, where the consumer complains of his light, and will not have it rectified on the score of expense. Little things like these go a very long way with some consumers; and as we have now so many competitors—electric light in the large towns, acetylene in the small, and kerosene in both—we must look to the gross result. If we can retain a consumer by supplying these things, and keep out our opponents, we have achieved more than the worth of the gift.

I have said that the country manager has an advantage over the town manager; but, on the other hand, the town manager has an enormous advantage over the country manager, in the fact that his gas is reasonably cheap. A far greater advantage, however—almost an incalculable one—lies within his reach. He can adopt the prepayment meter, by which he can reach a multitude of people who would otherwise never become consumers. The prepayment meter has gone far beyond the experimental stage, and has proved over and over again to open up entirely new fields for the development of the gas industry; and yet many managers leave this important boon severely alone.

Of course, in the case of the smaller works (to which I belong) it cannot be worked to any advantage, as the high price of gas prohibits it being dealt out in pennyworths; but with larger works, where a minimum of (say) 14 cubic feet for 1d. can be given, it is well worth trying. By fitting up a house with a pendant, two brackets, and a boiling ring, and charging (say) a maximum of 1s. per 1000 cubic feet over the ordinary meter, a good return may be had on the investment. I do not advocate the indiscriminate fixing of stoves free; a boiling ring suffices in the majority of cases. In my personal experience in the South of England, I found that very many consumers took advantage of the stove being supplied free, but never used the oven at all. A large number of these we had subsequently to remove, and generally found them in a very neglected condition. On the other hand, the boiling-rings were invariably used (in some cases only to boil the kettle in the morning, while the fire was lighting); and they paid well. With regard to stoves, we afterwards adopted the hire-purchase system, which we found to work out very well, as the purchaser, knowing that the stove would eventually become his own, took good care of it.

It hardly comes within the scope of this paper; but as it is a matter closely connected with the slot-meter, perhaps I may be pardoned for mentioning an appliance for facilitating the counting of coins. It is the invention of Mr. Wimhurst, and is in the form of a V-shaped aluminium tray, with the discharge just large enough for a penny to go through, set at the best angle for quickly passing the coins from the tray into the bags. It is padded underneath with rubber to prevent it slipping.

Finally, it is my opinion that we should let as much light into the working of our undertakings as possible. Many people are entirely ignorant of our commodity. Really intelligent people say, "What is a bigger liar than a gas-meter?" and talk of our putting in quantities of air to sell instead of gas. I believe in explaining to them the construction of a meter (showing what an accurate measure it is), the fact that 5 per cent. of air reduces the illuminating power of the gas by at least 33 per cent., the principle of the bunsen burner, &c. Our aim should be to sell gas as cheaply as possible (not being too particular as to it being of high candle power, as this is not of such paramount importance since the advent of the incandescent burner); supply incandescent burners at cost price—or even free (as it is the profit on gas we want to obtain, not on fittings); adopt the slot-meter wherever practicable, and push it for all it is worth; give a ready ear to consumers' complaints; and, in fact, create in them the desire for better and more light. We should thus be able to prove that, although electricity was said thirty years ago to be the light of the future, it is still the light of the future, but gas is, and will long continue to be, the light of the present.

Discussion.

The President remarked that Mr. Morris had not said anything about the price of his gas; and this might be an important factor.

Mr. Morris replied that the price of gas at Seymour was 12s. 6d. per 1000 cubic feet.

The Chairman said it had been a feature of the discussion that morning that they should reduce the price of gas if possible. He supposed 12s. 6d. was about the highest figure quoted.

Mr. Frost (Beechworth) said that, as compared with coal gas, his price was only 8s. 9d. They were turning out oil gas of about 36-candle power, and consequently they reduced the consumption.

Mr. B. Lord remarked that in Maryborough the price was from 8s. to 10s. per 1000 cubic feet.

Mr. Hawley (Brighton) said that for lighting they charged 6s. 8d., and for cooking 5s. 5d. They gave 4d. discount if consumers paid at the office before the 10th of every month, and so saved the cost of collection. Collecting cost 3d. per 1000 feet, so that they did not lose much by giving this discount. If he could only sell his gas as cheaply for cooking in Sandringham as they could in Melbourne, he would be all right. Slot-meters were charged the same prices, but they allowed discount. The slot-meters were only put out for risky ventures, with the idea of getting the money in. Of course, the incandescent light was a great advantage. For two or three years he had sold a very good incandescent burner with an opaline chimney at 2s. fixed. He sold mantles at 6d. singly, and cheaper by the dozen. The great thing was to sell gas cheaply. Unfortunately, their prices—what with over-capitalization, &c.—were too high; otherwise they could do far more business. While he was on his feet, he might make a few remarks about what Mr. Warren said as to giving good-quality gas. He wished to turn his concern into a coke company, and the gas and tar would have to be residuals in the long run. He wanted to bring the quality of the gas down. He did not trouble what the output per ton was. He wished to know what money he could get out of the coal; and he schemed to get as much as he could in every possible way. They must bring down the net cost of production, He was using wood with his coal, for the purpose of bringing down the quality, not bringing it up. When he was in New Zealand, he was getting more for his coke and tar than the coal came to. He had a connection made, so that when the holders were full, he could turn the gas into the furnace. They should all strive to bring down the cost of production and sell gas cheaply, taking charge of incandescent burners.

Mr. Holmes Hunt (Melbourne) said he took it that the object of the paper was to set forth the best ways of selling gas; and he thought from reading it through they might take it that Mr. Morris had two chief methods. The first was to employ everything up-to-date that they could get to encourage the consumers in the use of new appliances; and the second was to use slot meters. It appeared to him that the first method had to be carried out everywhere—that was to say, they must keep in touch with their consumers, whether they ran a big company with 60,000 customers or a small one with only 400. But he could not follow Mr. Morris's argument about the prepayment meter being solely an advantage for large companies. He would like to know what he was really doing in the matter of prepayment gas-meters at Seymour. Mr. Morris ought to be able to sell gas by means of shilling slot-meters, on similar lines to penny prepayment meters in Melbourne. The slot-meter, as they all probably knew, had been lately introduced into Melbourne on a system similar to that adopted by another gas undertaking in Australia and in most of the towns in England. In Melbourne, they were putting in installations in houses at the rate of sixty per week at present; and the meters were adjusted to give 15 cubic feet for 1d. They were putting all the fittings in order, piping the houses when necessary, adding new fittings in the way of brackets or pendants if so desired, and putting in grillers in the kitchens. They were also fitting up incandescent burners. He thought this was the first system of slot-meter installations which included that. At any rate, he had not heard of any other. When he came to Melbourne, he found that they had to contend against kerosene lighting, which was practically the only lighting of small householders. They had to give the people a better light than kerosene—which would be practically equal to a flat-flame burner—or else he realized they should not get on, having regard to the selling price. Therefore they put in an incandescent burner with each slot installation, and, what was more, supplied each with a mantle every six months. They had over 4000 installations fixed at the present moment. They were proving a great boon to the smaller householders. He believed it was said that one often had to go abroad for news of home. He had read only recently a paragraph taken from the "Ironmonger," which referred to what was stated to have been done in Melbourne regarding slot installations. It was said that people were using the meters as money-boxes. There were one or two isolated cases of this being done; but it had by no means become the general thing that it was at home. The writer also referred to the flat flames which the slot customers were using. He would repeat that one of the features of the installation was the incandescent burner, though, of course, any extra burners supplied free were flat flames. But in many instances the consumers were purchasing additional incandescents. He was very much in accord with Mr. Hawley in saying that they wanted to get down to a low-grade gas. The low-grade gas produced by a combination of wood and coal was a matter that he should be interested to know something about. He hoped that Mr. Hawley would not only tell them more about it, but that he would allow them on some future occasion to visit his works and see the plant and method that he was using for producing his gas.

Mr. Warren (Footscray) said he believed he was the first one to introduce the slot-meter into Victoria and Australia. It was very successful, and many companies wrote to him to ask for the benefit of his experience in the matter. He met with a drawback some time ago which made him almost resolve to use no more of them. Thieves got on to the verandahs where they were fixed, wrenched the locks off the meters, and made away with the money. This had given them a lot of trouble. They supplied the slot meters because they wanted to sell their gas in houses which were lighted with dingy kerosene lamps that only made darkness visible; and they also wanted to get slot meters put into houses occupied by people from whom they had difficulty in getting money. When at length he caught one of



The Tooronga Holder of the Melbourne Gas Company.

the thieves red-handed, the magistrate told him that he ought to have had the meters put in boxes inside the houses. The introduction of the penny-in-the-slot meter was a great advantage in the towns and cities of Victoria. They had to go round to them once a month or once a quarter only; and he thought there was a saving in the selling of gas. A ton of coal went up to Seymour for about 10s. or very little over. That was 1s. more in freight than it cost to go to Footscray. Would it not be better for Mr. Morris to reduce the price of his gas to about 8s., and secure double the custom? Of course, he did not want coke, because they had got wood; and perhaps coke accumulated on their hands as dead stock. At Seymour, 200 to 300 consumers, he supposed, would be the maximum.

Mr. Morris answered that it was less than that.

Mr. Warren said that was no doubt the reason for keeping up the price. If they put in slot-meters, they could do better.

The Chairman said that they ought to move a vote of thanks to the readers of the papers, which had been well discussed. With what Mr. Warren had to say about high-quality gas, and Mr. Hawley about low-quality gas, he thought the debate had been very useful. He had a friend who had told him that he was submitting to Mr. Swinburne—as Minister—a scheme for Government electric lighting by water power that would permit him to bring current to Melbourne and Ballarat cheaper than was being done now. So they were to have fresh competition; and Mr. Figgis also would have a new competitor.

Mr. Morris said that a question had been asked as to the price of the installation of the slot-meter. He knew that in the South of England it ran into about £3, with two pendants and a bracket, &c. Perhaps Mr. Hunt could tell them more exactly. As regarded the use of slot-meters as money-boxes, he had taken as many as twenty meters in the course of a day in England in which 2s. pieces had been inserted instead of pennies. He understood Mr. Warren to say something about receipts. They never gave a receipt for a slot-meter. People would be taken aback to find that they had put so many pennies in, and it was as well to keep them in ignorance by not giving them receipts.

The President proposed a vote of thanks to Mr. Bearup and Mr. Morris for their papers; and it was carried by acclamation.

The New Office-Bearers.

The election of officers was next proceeded with; the following being unanimously chosen:—

President.—Hon. George Swinburne, M.L.A.
Vice-President.—Mr. S. E. Figgis (Ballarat).
Member of Council.—Mr. W. Hawley (Brighton).

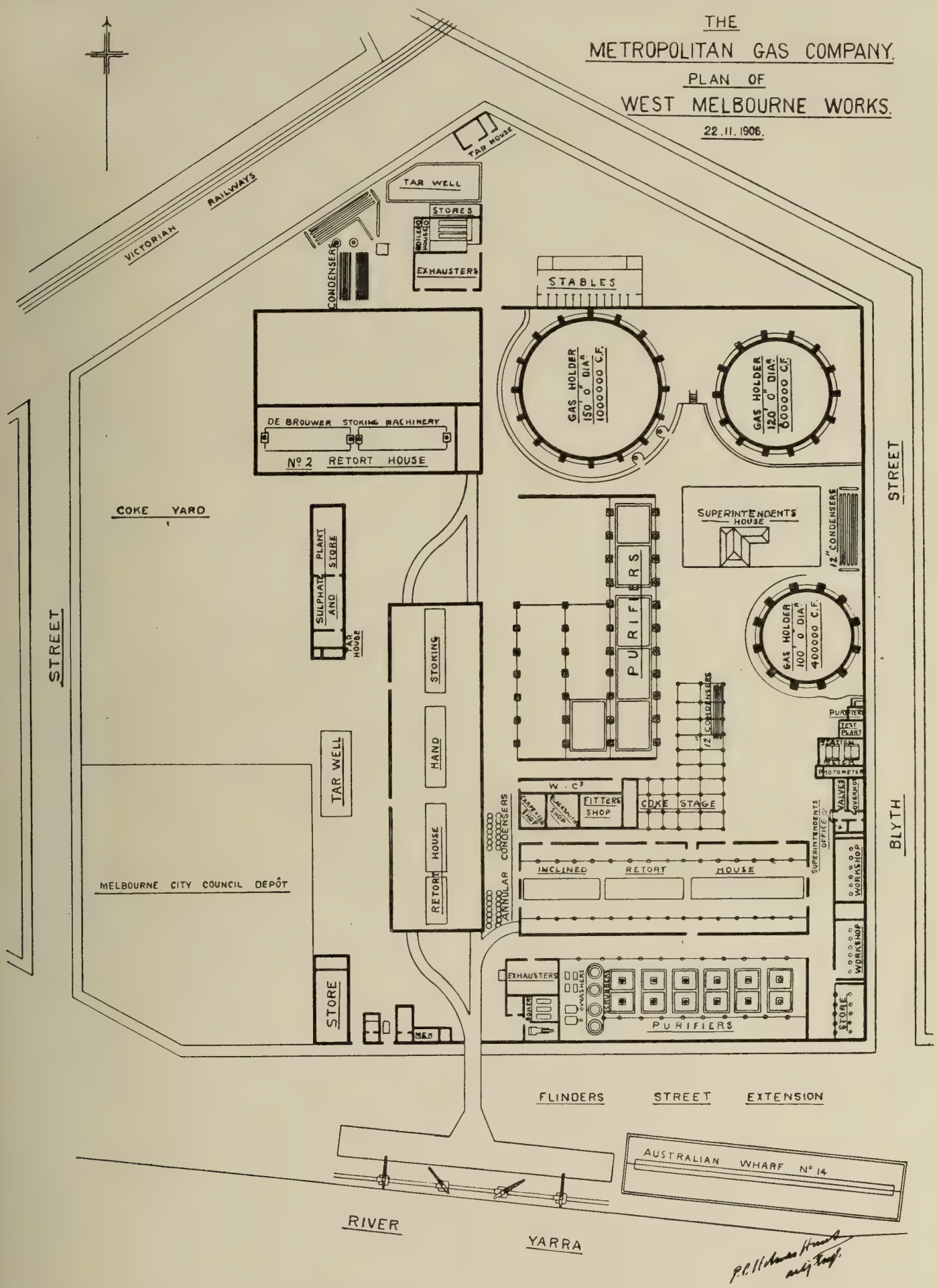
It was also decided to hold the next meeting in Melbourne.

The proceedings terminated with a hearty vote of thanks to the President for the excellent manner in which he had filled his office.

VISIT TO THE MELBOURNE GAS-WORKS.

The following day, a visit was paid to the West Melbourne works of the Metropolitan Gas Company and also to the Tooronga out-station; the Association being the guests of the Company for the day. The members assembled at ten o'clock at the Gas Offices, and were driven to the West Melbourne works; the new President (Mr. G. Swinburne, who is a Director of the Company) and the retiring President (Mr. R. O. Thompson, their Consulting Engineer) accompanying the party.

On arriving at the works, the members were met by the Company's Acting Engineer (Mr. P. C. Holmes Hunt) and the Works Superintendent (Mr. J. W. Thompson), who showed them over the station. The works are situated on the north bank of the River Yarra, about a mile from the centre of the city, and the gas made is distributed in the northern suburbs and the city proper. The



Company have their own coal wharf, on which is erected a viaduct connected to the works by a bridge crossing the roadway between the river and the works; on this runs a narrow-gauge railway, extending through the retort-houses and into the various coal stores. The coal is unloaded direct from the steamers at the rate of 120 tons per hour by four hydraulic cranes into the trucks on the viaduct, and conveyed to the various places of discharge by two steam locomotives. One of Messrs. John Abbot and Co.'s 60 N.H.P. hydraulic pumping-engines, with an accumulator pressure of 750 lbs. per square inch, provides the necessary power for working the cranes, capstans, &c.

There are three retort-houses. No. 1 contains 175 inclined D retorts, set in beds of seven, heated by regenerative furnaces. The coal breakers, elevators, and conveyors, with the overhead hoppers, measuring chambers, and charging-shoots, were supplied by the New Conveyor Company, and erected under the supervision of the Company's Engineer in 1902. No. 2 house is at present undergoing reconstruction, and round this the interest of the visitors mostly centred. Sixteen beds of horizontal retorts, in settings of eight, are being erected; and it is intended to instal a De Brouwer projector and discharger for working them—an electrical power-house being provided close by. Owing to the

treacherous nature of the subsoil at these works, considerable difficulty has been experienced in regard to the foundations; but the whole of the settings are being built on a raft of reinforced concrete 204 feet by 30 feet. A coal-store of 8000 tons capacity adjoins the house. In No. 3 house there are 189 horizontal oval retorts, set in beds of seven, direct fired; the retorts being charged and drawn by hand. This house is kept as a stand-by, and also utilized as a coal-store.

On the south side of No. 1 retort-house is a brick building containing four Livesey washers, two "Standard" washers, four Dempster tower scrubbers, and three sets of four purifiers standing on an elevated floor, with an oxide-revivifying floor underneath, and also hydraulic lifts for raising the oxide. On the north side are the smiths' and fittings shops. On the north side of No. 2 retort-house is an engine and exhauster house, in which there are two horizontal engines driving two sets of Beale's rotary exhausters, each pair of 160,000 cubic feet capacity, and three Lancashire boilers, each 30 feet long and 7 feet diameter. Behind the engine and boiler house there is a set of horizontal pipe condensers, two of Cutler's "Perfect" water condensers, and one of Walker's purifying machines. There is also an underground tar-tank with storage capacity for 240,000 gallons. On the east side of No. 3 retort-house there are two sets of annular condensers and a large purifying-house with six 50 ft. by 40 ft. purifiers on the ground floor, arranged with hydraulic power for lifting the covers and elevating the oxide to an overhead floor. On the west side are two underground tar and liquor tanks to contain 220,000 gallons; and here also is the sulphate of ammonia plant, consisting of two complete units.

There are three two-lift gasholders, with a total capacity of 2,200,000 cubic feet, with an out-station holder of 3,000,000 cubic feet capacity.

The Superintendent's office, experimental plant, and drawing offices are placed on the east side of the works, together with the station meter, valve, and governor house; and adjoining are the photometer-rooms and the laboratory.

About 48,000 tons of coal are carbonized annually at these works.

The inspection over, the members were taken in conveyances to the gasholder at Tooronga—an out-station situated in the outer suburb of Malvern. On arriving, they were entertained at luncheon by the Company—Mr. Swinburne being in the chair.

After luncheon, Mr. Thompson read a few notes descriptive of the holder, and explained that the Company purchased the land in 1890, the original intention being to build a small gasholder. Ultimately, however, a 3 million cubic feet holder was decided upon. The tank is 200 feet in diameter and 36 feet deep; the top of the tank coping being 12 feet above datum, in order to provide against storm waters. The holder itself, which is in three lifts, was erected by Messrs. Clayton, Son, and Co., Limited, of Leeds; and all the material was delivered on the site by a specially constructed branch railway. The engine and exhauster house contains two sets of 80,000 cubic feet per hour exhausters, driven by two 12 H.P. Crossley gas-engines; the gas being drawn from the South Melbourne works—a distance of some six miles—through a 24-inch main, and pumped into the holder. From this station gas is distributed to the different suburbs through 24-inch governors of Cowan's make.

Mr. Thompson proposed "The Health of the Metropolitan Gas Company," coupled with the name of Mr. Swinburne, and referred to the great interest this gentleman had always shown in gas matters. In reply, Mr. Swinburne referred to the encouragement the Association warranted, and said the Companies with whom he was connected had determined to do all in their power to promote its interests and encourage gas managers to join.

Mr. John Hinde (the Secretary to the Company) also replied.

The proceedings terminated with votes of thanks to the Council and the Hon. Secretary, which were duly responded to.

On leaving the marquee, the members inspected the holder and the engine-house; and they were subsequently driven back to Melbourne after an enjoyable outing.

STRAIGHTENING A TALL CHIMNEY.

An unusual method of foundation reinforcement was recently adopted to stop the settlement and straighten a large brick chimney at the Detroit (Mich.) works of the Solvay Process Company. The chimney is a 250-feet circular brick one, with an interior diameter of 20 feet, which serves the boilers of the power plant at the works. The foundation as originally built was of concrete, about 50 feet square, resting on clay at a level about 16 feet below the surface. Above this the solid masonry base of the stack rises to a point about 10 feet above the ground, where the brickwork commences. Two years after the erection of the chimney, it had settled more than 1 foot—one side about 6 inches more than the other. As it appeared probable that further settlement would follow, a firm of engineers was called in to suggest a method of stopping it, and, if possible, to re-align the structure. After examination, the following method was adopted, according to "Engineering Record," and it has been carried out in all essential particulars.

The foundation was found to have a bearing area of 2444 square feet on a clay which, while of ordinary firmness, might admit of further settlement under the weight of the chimney. It was accordingly decided to spread the foundation somewhat on two sides, with the greater widening on the side which had settled the most; so that if further slight settlement should ensue, it would tend to throw the stack back into a vertical position. This was accomplished by building extension footings of concrete outside the masonry foundation, and bonding the extensions to the main structure by cutting slots into the latter just below the ground level, into which the concrete extensions were grouted with steel reinforcement. The slots were about 2 ft. 6 in. deep and the same height; and the reinforcement planned was of 12-inch I-beams, about 6 feet long, spaced on 16-inch centres. The concrete extension footings were installed with considerable care, in sections 6 or 8 feet long; the concrete being firmly rammed into place. The footings were 10 feet wide at the base, and on the easterly side extended the width of the original foundation only; while on the westerly side, towards which the stack had leaned, they were carried the full length of that side and round at the ends for a considerable distance. The total area of new footings planned was 1480 square feet, of which the section on the westerly side had an area of 970 square feet, and that on the easterly side an area of 510 square feet. The remainder on this side has been omitted for the present, to give the chimney a chance to settle back plumb. After that the footings on the easterly side may be increased to the extent planned, or even more. The total bearing area of the extended foundation is now 3414 square feet. Our contemporary says that the expectation of the engineers has been fully realized, and the chimney now stands secure.

REPAIRING A CRACKED GASHOLDER TANK.

A recent issue of the "Journal für Gasbeleuchtung" contained a note by Herr Nebendahl, of Wandsbeck, describing the manner in which he succeeded in making sound the gasholder tank on his works. The tank—98 feet in diameter and 26 feet high—was built, in 1891, of rammed concrete. In the summer of 1897, it began to leak a little; but in November of that year it suddenly developed an oblique crack, and lost water at an average rate of some 11,000 gallons per day. As the holder could not be thrown out of action, and the leak appeared to endanger the works, a hoop of wrought iron, about 5 inches wide by 0·6 inch thick, was tightened round the projecting piers of the concrete tank, some 3 feet below the rim; wedges being driven between the hoop and the panels of the tank, and the whole filled up with concrete. By allowing all the condensing water, &c., to flow into the tank, and by constantly adding sawdust, stable refuse, fibrous matter, and the like, it was found possible to keep the tank full to within 3 feet of the top until the end of the busy season. The following May, as the leak was no better, the ground round the crack was dug out to a depth of 21 feet, and the crack itself, which was nearly 0·1 inch wide at the top, was cut out for a width of 2 feet almost right through the concrete from the exterior to the interior surface. The opening was next filled with new material, and the cement was left for about three weeks to harden. The tank then remained perfectly tight until July, 1903, when a small leakage developed again. By the end of the following October, the leak had attained its original magnitude—a crack appearing at the side of the fresh concrete. Finding himself in the same position as before, Herr Nebendahl determined to try the effect of some more flexible material. He ran the water in the tank down as far as he could, and painted the interior face with hot tar—making a patch 20 inches wide and 8 feet deep round the crack, and covering it with coarse sacking, to which more tar was applied. The operation was repeated until a "plaster" composed of three thicknesses of sacking and four of tar was obtained, the whole being about 0·3 inch thick. With periodical additions of water and fibrous matter, the holder was kept in action till May, 1904, when the tank was emptied to 5 feet from the bottom, without unsealing the bell, and the patch was examined. As it appeared to be perfectly sound, except at a few spots where the tar had not properly dried, a new "plaster," prepared in the same way, was put on, reaching from the rim to the bottom of the crack in the concrete. This new patch has lasted to the present time, and does not permit of any leakage. The renewal of the concrete on the first occasion cost some £110, and occupied about a month of labour; whereas the tar patch was applied in two days, at a cost of £6.

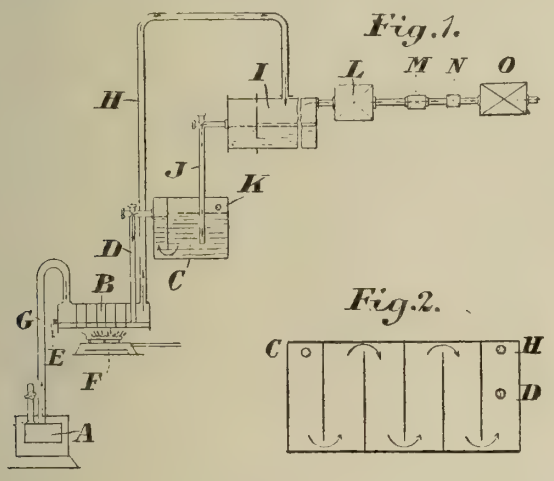
The Institution of Mechanical Engineers will resume, at the ordinary general meeting to be held next Friday, the adjourned discussion of the paper on the "Indoor and Outdoor Lighting of Railway Premises," which Mr. Henry Fowler, of Derby, read last month.

The Yorkshire Junior Gas Association will hold a meeting next Saturday, at the Municipal Technical School, Halifax, when Mr. J. H. R. Appleyard, B.Sc., will deliver a lecture on "Ordnance Maps: What they Teach Us, and How to Read Them." It is pointed out that this is one of the subjects referred to by Mr. Thomas Newbigging in his address to the Association at the annual meeting last October.

INCREASING THE PRODUCTION OF GAS.

The Blanc and Caton Process.

A French patent has been taken out by MM. Blanc and Caton for a process for increasing the yield of gas and for effecting automatically the revivification of the purifying materials. It consists in recovering the illuminating hydrocarbons in the tar, conveying them, by means of an injected current of air, into the gas in course of manufacture, and enriching the produced gas by benzol or other material rich in hydrocarbon; the effect of the series of operations being, it is claimed, an increase ranging from 12 to 20 per cent. in the quantity of gas produced without affecting its illuminating power. The method of regulating the quantity of air to be introduced is a simple one. An ordinary gas-meter, furnished with a suitable dial, is fixed upon an air intake. After passing through the meter, the air is led into an apparatus fitted with partitions—a "saturator"—into which falls the tar taken out of the gas. In the saturator the tar is brought to a suitable temperature to enable it to undergo semi-distillation, to extract from it its light-giving hydrocarbons. The temperature must not, however, be lower than 200° C. (392° Fahr.), so as to avoid the formation of solid lumps of viscous material. The air passing from the meter into the saturator is consequently charged quite naturally with the hydrocarbons thrown off by the hot tar; and the air acts as the vehicle for conveying them, by suitable means, into the hydraulic main, where they mix with the hydrocarbons held in suspension in the gas contained therein. The saturation of the carburetted air is completed by the introduction, by means of a drop-counting distributing apparatus fixed after the exhauster, of a small quantity of benzol, or other material rich in hydrocarbon, proportionate to the bulk of gas made.

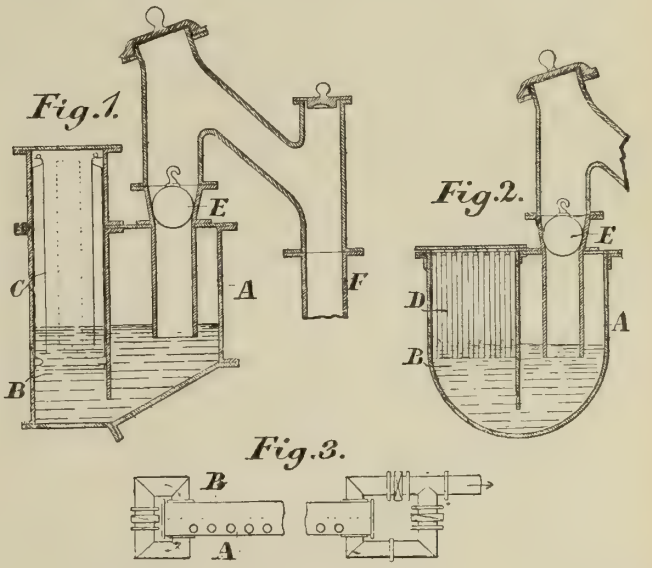


The accompanying illustration represents the arrangement of the various portions of the apparatus to carry out the invention. In fig. 1, A is the air-meter, B the saturator (a horizontal section of which is shown in fig. 2), C the tar vessel, receiving, by means of the pipe J, the tar from the hydraulic main I, and discharging it by the pipe D into the saturator, whence it is removed by the pipe E; the liquor being taken off at K. The saturator may be heated by the special device F, or, in small works, by the waste heat from the retort-furnaces. The air passes from the meter by the pipe G into the saturator, and thence by the pipe H to the hydraulic main, from which it flows on to the purifier L and to the exhauster M; after which point it receives the additional benzol from the distributor N, passes into the purifiers O, and finally into the gasholder. The arrangement shown is only suggestive, as the process may be carried out in several ways. The object in adding benzol at the point N is primarily to ensure the proper illuminating power of the gas, irrespective of any variations that may take place in the manufacturing process; but it also has the effect of correcting the tendency to deposition of naphthalene.

An important advantage claimed for the process is that, by the introduction of carburetted air into the gas before it passes into the purifiers, it is possible to have continuous automatic revivification of the oxides. The present system of exposing the material to the air, or alternatively of allowing the air to act upon it *in situ*, not only entails expense for labour, motive power, and extra plant, but causes loss of time while the purifiers are out of action. Moreover, there is danger of fire resulting from excessive heating. By the introduction of carburetted air in the manner described, these inconveniences are avoided. In fact, revivification being effected simultaneously with purification, no stoppage of work is necessary until the material is completely spent. With the view of preventing the drying and subsequent hardening of the oxide, it should be moistened from time to time, either by raising the lids and sprinkling it, or, better still, by injecting steam at the bottom of the purifiers. But in order to obtain the best results, it is preferable to work with natural oxides of homogeneous composition, and to regulate the speed of the gas in its passage through the purifiers so that it does not ever exceed 12 inches per minute.

COMBINED CONDENSER AND HYDRAULIC MAIN.

With the view of preserving the maximum illuminating power of gas, study and practice have led to the laying down of certain conditions for good condensation; and one of these is that the greater portion of the tar must be removed hot, and contact of the gas with the products of condensation avoided. The plant now in general use, though giving good results, is considered by some to inadequately fulfil this condition. In the foul main, which is usually circular and of large section, only the gaseous molecules near the bottom deposit tar; the principal portion of them, though subjected to the cooling action of the pipe, moving along with nearly all the tar in suspense. The consequence is that, even after what is considered to be adequate condensation, considerable quantities of tar are found in the syphons on the works, as well as in the purifiers. Investigation into the present method of condensation led MM. Blanc and Caton to devise the arrangements shown in the accompanying illustrations, for which they have taken out a patent in France. The object is to effect the complete condensation of the tar as soon as it leaves the hydraulic main, and consequently while it is still hot; and the principle of the invention is the multiplication of the points of contact presented to the gaseous current.



The above illustration shows two types of the appliance; fig. 1 being a transverse section of the "plate" condenser, and fig. 2 a similar view of the "rod" condenser. Fig. 3 shows, on a small scale, the distributing arrangements. The apparatus is constructed of sheet or cast iron, and is divided into two compartments, A and B, by a partition reaching to within a few inches of the bottom. These compartments communicate, as shown in fig. 3, by nozzles and suitable valves. Compartment A constitutes the hydraulic main, into which the dip-pipe enters, while B is the condenser. In the type of apparatus shown in fig. 1, the latter compartment contains a series of vertical plates C, so arranged as to baffle the gas as it flows along. These plates are of two kinds, some having a single opening and others two openings—the superficial area of the latter being equal to that of the former—and they are placed alternately at suitable distances apart. The rate of flow of the gas remains constant at all points of the apparatus. The plates, which, as will be seen, dip into the liquid in the main, are fixed in grooves in the sides, and suspended in any suitable manner. After they have been placed in position, the vessel is hermetically sealed by a cover secured by a bolt. The action of the gas when it leaves compartment A and enters B is easy to understand. The flow of the gaseous fluid is baffled by the plates C, the solid portions in some of them corresponding to the openings in others—thus giving a large condensing surface in a small space, and compelling the tar held in suspension to deposit on the plates, and flow naturally into the liquid in the main, whence it is removed by any suitable means.

In the arrangement shown in fig. 2, for the plates are substituted a suitable number of tubes or hollow rods D, arranged in zigzag fashion. In this type of apparatus, condensation is effected in the same way as in the one previously described, though much more advantageously, seeing that a greater contact surface is presented to the gas. In both types, as will be seen, the dip-pipes are widened at the part just above the main; thus enabling the ascension-pipe F (not shown in fig. 2) to be isolated by the insertion of a spherical body E in the conical portion of the pipe.

Alderman William Thompson, who resigned the leadership of the local Conservative Party at Blackburn at the beginning of last year, has lately been presented with a costly canteen of silver, consisting of 278 pieces, weighing 350 oz.; Mrs. Thompson being the recipient of a gold and diamond pendant. Alderman Thompson was for a time Chairman of the Gas Committee of the Corporation.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

A Meeting of the Western District Section of the Association was held in the Technical College, Glasgow, on Saturday evening—Mr. J. M'Leod (Provan), the President, in the chair. There was a very fair attendance of members.

Mr. John Wilson (Glasgow) opened the business by reading a paper, from which the following are extracts, on

GAS-TURBINES.

In the Temple Gas-Works, there stands one of the earlier forms of gas-exhausters. It consists of three vertical cylinders fixed to a bed-plate; the two outside ones being exhausters, and the central one the steam-cylinder. The crank-shaft has one central crank and a disc at each end, and rests on a frame supported by columns about 7 feet high from the floor-level. The steam-cylinder is 12 inches diameter by 24 inches stroke; and the exhauster cylinders are 24 inches diameter by 24 inches stroke. Its capacity is about 1 million cubic feet per day, or (say) 41,000 cubic feet per hour. It was arranged to work with a boiler pressure of 40 lbs. per square inch; the engine running at 60 revolutions per minute when working at its maximum capacity. This type of exhauster gives fairly good results. The cost of maintenance is low, as the wear and tear is comparatively small. The chief objection is the pulsation set up by the action of the reciprocating piston, though this is minimized to a great extent by setting the two disc crank-pins at an angle of 45° to each other. Until quite recently this exhauster had been in constant use at the Temple works since the year 1872.

Having described the Beale and Waller exhausters—the former in use at the Dawsholm and Tradeston works, and the latter at Provan—the author went on to say: The turbo gas-exhauster is used at the Provan works for pumping the gas made there through a 36-inch main down to the Dalmarnock works. The distance between the two works is 5000 yards; and the level is 169 feet lower at Dalmarnock. The turbo gas-exhauster is a combination of a Parsons steam-turbine with a gas pumping-turbine.

The turbine engine consists of a revolving shaft fitted with rings of outwardly-projecting blades, running inside a cylinder fitted with rings of blades, but this time projecting inwards. The rings of blades of the case just clear the shaft; and between them those on the shaft spread out and almost touch the inside circumference of the cylinder. The steam enters, and first passes through one ring of fixed blades, and is projected from them in a rotational direction against the immediate set of moving blades attached to the shaft, imparting to them a rotational force. Its direction is again changed against the succeeding ring of fixed guide-blades; and the reaction caused increases the rotational force. This same process goes on as the steam reaches each successive set of guide and moving blades. The energy required to infuse into the steam its high rotational velocity is furnished by lowering the pressure; the steam expanding gradually in small increments.

At the end of the shaft there are pistons or dummies which are grooved to fit into similar grooves in the cylinder. As these dummies are to prevent end-thrust, there is a passage in the cylinder connecting each diameter of the shaft with the corresponding dummy of the same size. By means of a thrust-block in the end oil-keep, the clearance between the grooves can be adjusted longitudinally—thus forming practically a steam-tight joint. The exhauster end of the machine is directly coupled to the steam-turbine. The shaft carries propeller-blades which run between sets of stationary guide-blades. Both the propeller and the fixed blades are curved and set at a suitable angle to give the maximum efficiency. The inlet-passage is at the steam-turbine end of the exhauster, and the outlet at the other. These can either be placed on top of the turbine or underneath, as the circumstances may require. The shaft at the outlet end is swelled out to a larger diameter, in order to form a dummy piston, like those in the turbine engine, so as to counteract the end-thrust due to the moving blades.

The manner in which the gas is driven forward may be explained as follows: On entering the turbine, the gas meets the first set of moving blades, which impart to it considerable rotational velocity in the direction of the outward end. The first row of guide-blades redirects the gas in a longitudinal direction on to the second row of moving blades, where it receives a second increment of velocity and pressure; and so on, until, on reaching the outward end, it has attained the pressure necessary to force the gas through the pipes. The bearings are of the tubular cushioning type. A small pump, driven by worm gearing from the turbine-shaft, provides for the lubrication of all the bearings. In this way, the oil is circulated through the cooler end-bearings by means of service-pipes at a pressure of 8 lbs. per square inch. As the revolving shafts are of light weight, the wear in the bearings is so little that they frequently run for several years without having to be adjusted. The pressure in the gas-turbine is maintained by means of the velocity of the moving vanes; consequently there are no delivery valves to become damaged or to require renewal.

The large turbo gas-exhauster engines are governed by a sensitive centrifugal governor, which actuates the steam-admission valves, through the medium of a steam relay. At Provan, the engine is governed by a Tangye "Soho" centrifugal safety governor; so that, if the governor belt were to break, the governor would automatically cut off the steam and stop the engine. The steam is admitted periodically by means of a cam on the oil-pump shaft; the position of the centrifugal governor determining the duration of each gust. One of the outstanding features of the gas-turbine is its steadiness of pressure; since, as the action of the machine is purely a rotary one, the flow of gas is perfectly steady and continuous—thus overcoming the pulsations and more or less violent fluctuations in pressure due to the stroke of the piston in the reciprocating engine, and the intermittent action of the blades in exhausters of the Beale type. Then, again, there are no clearance losses in the turbine; therefore an absence of the slip so frequently met with in other types.

With the exception of the bearings, no parts of the steam or gas turbine come into rubbing contact, so that internal lubrication is unnecessary. The result is that the exhaust steam is kept clean and free from grease, and may, if desired, be condensed and sent back to the boiler without filtering. In the gas-end, there is practically no lubrication at all required, and no glands to demand constant repacking. The upkeep of the machine is, therefore, reduced to a minimum, and is quite different in this respect from the ordinary exhauster, where, owing to the large area of rubbing surface, a considerable quantity of lubricant is necessary.

When the turbo-blower had been finished, it was tested by being run on air before leaving Messrs. Parsons' works at Newcastle. In order to get an output of 13,000 cubic feet of air per minute, it was necessary to greatly increase the pressure difference between the inlet and outlet; and, as a consequence, the turbine required much more power than it would do when working on gas. It was, however, possible to determine the horse power developed from the pressure and volume of the air dealt with, and thus to obtain the steam combustion per horse power. The delivery pipe from the blower was connected up to a cylindrical chamber having a thin-lipped circular orifice of $11\frac{3}{8}$ inches in diameter (area 0·708 square foot). A pressure-gauge and thermometer were mounted on the chamber, and readings were taken continuously. The steam used was passed into a condenser, from which it flowed into tanks, where its weight was taken. The condenser was open to the atmosphere, and was used merely to condense the steam, and not to create a vacuum. The steam pressures were taken on the turbine side of the governor throttle-valve, and also at the boiler.

Three tests were made, with the result that the following data were obtained:—

Test No. 1.

Steam pressure, turbine side of stop-valve		= 126 lbs. per sq. in.
Air outlet	51·86 in. water-gauge	= 2373 ,, per sq. ft.
	Temperature	= 97·5° Fahr.
Air inlet	Barometer	= 29·69 in. = 2103 ,,
	Temperature	= 61·9° Fahr.
Speed		= 7850 revs. per min.
Steam consumption		= 4946 lbs. per hour.

Test No. 2.

Steam pressure, turbine side of stop-valve		= 100 lbs. per sq. in.
Air outlet	40·1 in. water-gauge	= 2311·5 lbs. per sq. ft.
	Temperature	= 91° Fahr.
Air inlet	Barometer	= 29·69 in. = 2103 ,,
	Temperatue	= 62° Fahr.
Speed		= 6700 revs. per min.
Steam consumption.		= 3950 lbs. per hour.

Test No. 3.

Steam pressure, turbine side of engine stop-valve		= 75 lbs. per sq. in.
Air outlet	29·4 in. water gauge	= 2256 lbs. per sq. ft.
	Temperature	= 84° Fahr.
Air inlet	Barometer	= 29·69 in. = 2103 ,,
	Temperature	= 61° Fahr.
Speed		= 5770 revs. per min.
Steam consumption.		= 3000 lbs per hour.

Calculating from the data obtained in the tests, we get the following

Summary of Results.

	Test No. 1.	Test No. 2.	Test No. 3.
Volume of air delivered at 60° Fahr. and 30 in. bar., in cubic feet per minute	13,409	11,600	9750
Pressure difference (water)	51·86 in.	40·1 in.	29·4 in.
Effective horse power of turbo-blower	105·5	74·0	46·0
Steam consumption per horse power	47·0 lbs.	53·4 lbs.	65·0 lbs.
Revolutions per minnte	7850	6700	5770

As will be seen, these trials on air were quite satisfactory, and showed that the turbine was fully up to its work. After it had been installed at Provan, and in use for a short time, it was again tested; on this occasion with gas. The steam consumption was not taken in this instance; but as the turbo-blower drew the gas from one $8\frac{1}{2}$ million feet holder, with all the other valves closed, it was possible to make direct measurements of the volume of gas dealt with, instead of having to resort to calculations, as in the air trials. The pressure thrown by the holder was $8\frac{1}{2}$ inches water-gauge; and the average temperature was 49·3° Fahr. The barometric pressure was 29·7 inches; and the specific gravity of the

gas at 60° Fahr. and 30 inches barometer was ·447. The following table shows the results of the tests with gas:

	Test No. 1.	Test No. 2.	Test No. 3.	Test No. 4.
Volume of gas delivered at holder temperature and pressure, cubic feet per minute . .	7916 ..	11,666 ..	15,166 ..	18,179
Pressure difference, inches of water-gauge	2·1 ..	7·4 ..	13·3 ..	18·0
Revolutions per minute	3500 ..	5292 ..	7266 ..	8568

The capacity of the blower at full load (Test No. 4) is 1,090,733 cubic feet of gas per hour. This is far too large a unit for adoption in place of ordinary exhausters. In this connection, it is worth noting that the turbo-blower can deliver more gas than the whole of the eight exhausters at Provan working together can draw from the hydraulic main. The steam consumption, it will be noticed, is heavy; the best result obtained being 47 lbs. per H.P. This is considerably more than would be used in a reciprocating engine, had such been adopted in conjunction with a fan or Roots blower. In either of these combinations, however, a much larger proportion of the power would have been wasted on belt-and-shaft friction; and it is doubtful if the steam used per 1000 cubic feet of gas blown would have been less. The steam consumption could have been greatly decreased by using a condenser; but as the turbo-blower is only employed intermittently, the additional capital cost would not have been justified.

The turbo-blower is admirably suited for the purpose for which it has been installed at Provan. It is small and compact for its output. It is easily started, and requires practically no preliminary heating up; and when once started it will run for hours without attention, with a perfectly steady gauge. It has little or no vibration, and requires no foundations worth speaking of. It is not even bolted down to the 3-inch reinforced concrete floor on which it rests.

The writer is indebted to Mr. James Lowe, the Assistant Manager of the Department, for the particulars of the tests given.

Mr. Wilson concluded by showing, by means of the lantern, a series of views illustrating the construction of turbines.

Mr. J. M. Popplewell (Glasgow) read a paper on

COAL TAR DISTILLATION.

After some preliminary remarks, the author said:

My object this evening is to give you a brief outline of the general principles involved in the distillation of coal tar. I do not propose to inflict upon you any technical details in connection therewith, but shall merely take, as it were, a "bird's eye view" of the whole industry as carried on at the present day. I propose to divide the subject into two portions—viz., (*a*) actual distillation of coal tar, and (*b*) subsequent treatment of crude products obtained in operation.

The distillation of coal tar is carried on in cylindrical wrought-iron stills. In some instances the bottom is convex, and in others concave; there being some difference of opinion as to which is the better adapted for the purpose. The capacity of the stills varies considerably in different works, and is usually anything from 10 to 30 tons. The still is fitted with a charging-cock, through which the tar is charged into the still; a run-off cock, whereby the pitch leaves the still at the end of the distillation; a swan-neck through which the products of distillation pass as vapour; and also a specially-arranged steam-pipe is provided on the bottom of the still inside, perforated with small holes for the admission of live steam. A safety-valve is provided on the dome. The still is connected to an ordinary worm-condenser cooled with water; and the end of the worm is coupled up to a receiver, into which the various oils flow. This receiver is in turn connected to a number of store-boilers, into which various products obtained at different stages of the distillation ultimately find their way. At the back of the still is a boiler, for running in the hot pitch as it leaves the still—this being known as the pitch cooler.

In carrying out a distillation, we will suppose the still is charged to within 2 or 3 feet of the top. A still must not be charged fuller than this, owing to the great tendency which crude coal tar has to froth in the early stages of distillation. This is caused by water which the crude article always contains; and the more water there is present, the more difficult will be the tar to deal with. A moderate fire is kindled under the still, which is maintained until distillation commences. The firing must now be done very cautiously—this being the most critical part of the whole process. If great care is not exercised, the chances are that the contents of the still will boil over. This means, of course, a certain loss of material; and also what is of infinitely greater concern to the tar distiller is the great risk of an outbreak of fire which is entailed by an occurrence of this description. The slow firing must be continued until the whole of the water has been expelled from the tar, which usually occupies considerably more than half the time required for the whole distillation. At the end of this stage, the firing may be increased, and the distillation will proceed much more rapidly.

Towards the conclusion of the process, when the run of the distillate begins to slacken somewhat, the distillation is considerably assisted by the introduction of open steam into the still by means of the steam-pipe. At the end of the process, the residue remaining in the still is pitch; and it is necessary to mix with it a certain quantity of heavy oil, in order to bring it to the proper consistency as required by commercial tests. After being allowed to cool in the still for a few hours, the pitch is run into the cooler, where it is left to cool to a still lower temperature, out of contact with the air. This precaution is necessary owing to the hot pitch being very prone to take fire spontaneously when coming into contact with the air. When it is considered that the temperature has been sufficiently reduced, the pitch is finally allowed to run into large shallow "bays" built of brickwork, where it sets into the hard, black, glistening mass, the appearance of which is well known to you all.

The distillates which are taken off during the process are usually as follows: Ammoniacal liquor; crude naphtha; light oil; creosote oil; anthracene oil. The changing points for the different fractions are sometimes ascertained by temperature, sometimes by the specific gravity of the distillate, and sometimes by the quantity of the distillate as previously ascertained by laboratory test. The changing points vary with different tars; and thus it is necessary to make an analysis of a tar in order to ascertain at which point it would be advisable to change in order to get the best yield of each product. Even a tar obtained from the same source will vary greatly from time to time.

Ammoniacal Liquor, of course, is utilized for the manufacture of sulphate of ammonia. As this process does not come within the domain of my paper, I do not propose to spend any time in a description thereof.

Crude Naphtha is regarded by the tar distiller as the most valuable of his crude products, because it consists chiefly of the light hydrocarbons—such as benzene, toluene, xylene, &c.—and also contains small quantities of pyridine bases and carbolic acid. In the rectification of crude naphtha, the procedure is usually on these lines: The naphtha is charged into a large lead-lined vessel fitted with agitating gear, generally consisting of a vertical shaft with a propeller. In this vessel it is subjected to a series of washings as follows: (*a*) With caustic soda, to remove phenolic bodies (carbolic acid); (*b*) with vitriol, to remove sulphur compounds and empyrematic resins and bases; (*c*) with caustic soda, to remove all traces of mineral acid. After the above treatment, the naphtha is ready for distillation, and is accordingly charged into a large wrought-iron still fitted with a fractionating column. The distillation is carried on by a system of steam-coils inside the still. The fractionating column is 20 to 30 feet in height, and is divided into a number of chambers by means of horizontal partitions. The overflow pipes, by means of which the condensings travel down from chamber to chamber, are so arranged that a depth of about 2 inches of condensings is always maintained on each plate; and each of the vapour uptake pipes is covered with a serrated cap dipping below the surface of the condensings, so that the vapour receives a thorough washing in its upward passage. The distillate is collected in the usual way, after passing through a worm-condenser cooled by water. The products obtained from this operation are known commercially as 90 per cent. benzol and 90 per cent. toluol.

Light Oil consists essentially of a mixture of the heavy naphthas with creosote oil. It also yields varying quantities of carbolic acid and pyridine bases. The procedure adopted in the treatment of this oil is: The oil is first charged into a cylindrical wrought-iron agitator, where it is thoroughly mixed with a solution of caustic soda, in order to remove the phenolic bodies. It is next charged into a still, where all the naphtha is distilled off; the residue remaining in the still being creosote. The naphtha obtained from this oil next undergoes a series of washings with vitriol and caustic soda, exactly similar to the treatment already described for crude benzol, after which it is again distilled. The products of the final distillation are solvent naphtha and heavy solvent naphtha. These naphthas, as the name implies, are principally used as solvents; the india-rubber trade taking a great quantity of the production.

Creosote.—This oil is the one which forms by far the greater part of the distillate obtained at the tar-stills, and is accordingly correspondingly low in market value. It is usually sold in the crude state, just as it is obtained by the first distillation of the tar. It is of a greenish yellow colour when fresh, but becomes darker on keeping. Its specific gravity ranges from 1·035 to 1·050. On cooling below 60° Fahr., the oil usually deposits salts of naphthalene; and for this reason it is usual to provide a steam-coil in the tank used for its storage. Creosote oil meets with many industrial applications, among which may be quoted: Softening hard pitch; pickling timber; preparation of varnishes; lubricating oil; manufacture of lamp-blacks; lighting (Wells lights, &c.); as an antiseptic; and blue steaming of bricks. Its chief use, however, is for the preservation of timber; and it has been pronounced by eminent authorities to be unrivalled for this purpose.

Anthracene Oil (*Green Oil*, *Red Oil*).—This is the last fraction to be taken off at the tar-still, and consequently consists entirely of high boiling hydrocarbons. The hot oil from the still is run into large shallow iron pans, where, on cooling down, crude anthracene salts out in the form of a paste. The slimy mass thus obtained is pumped through a filter press, which separates the crude anthracene from the oil. After removal from the press, it is further freed from oil by whizzing in a centrifugal machine. The product thus obtained will test 28 to 33 per cent. real anthracene. In some works, hot pressing is resorted to with equal success. The drained oil obtained in the above-named process is either added to the creosote or used for softening the pitch. Sometimes it is sold as a lubricant. The chief use of anthracene

is in the manufacture of artificial alizarin; the latter providing the colouring matter for turkey-red dyeing. Owing to the present low price of anthracene, many distillers do not consider it worth while taking off this fraction, but prefer to finish the distillation when the creosote is off. By doing this, the pitch that is left in the still is of about the proper consistency, and does not require the addition of oil for softening purposes.

Having now dealt with each of the crude oils as obtained at the tar-still, it might be interesting to touch upon one or two of the subsidiary processes which are often carried on in a tar distillery—such, for example, as the refining of naphthalene. Most tar distillers are equipped with the necessary plant for the extraction and refining of this article; but whether they will carry on the process or not, usually depends upon the state of the market. If, however, the price be sufficiently good to warrant its extraction, the methods usually adopted are as follows.

That fraction of the oil from the tar-still which contains the greater part of the naphthalene (generally the light oils, and probably the earlier portion of the creosote fraction) is run while warm into large shallow iron pans, where it is allowed to stand for two or three days. At the end of this period, a great quantity of naphthalene will have crystallized out from the oil. The latter is then separated from the salts, which are allowed to drain thoroughly. Even after draining for some time, however, the naphthalene still retains an appreciable quantity of oil. The salt is therefore next whizzed in a centrifugal machine, in order to free it as far as possible from all extraneous oily matter. The naphthalene thus obtained is, of course, only a crude article, and must be submitted to rectification.

The crude salt is now melted up, charged into a still, and distilled. The first 10 per cent. of the distillate, or first runnings, is ignored; the next 80 per cent. being collected as containing the best part of the naphthalene. This is again allowed to crystallize, and is then subjected to about 200 atmospheres pressure in a hydraulic press. The pressed salt has then to be washed. This is carried out in closed iron vessels lined with lead, in which the naphthalene can be heated above its fusing point by means of a coil or steam-jacket. The vessel is provided with the necessary mechanical agitating gear. The fused naphthalene is then subjected to the following washes: (*a*) Caustic soda; (*b*) hot water; (*c*) rectified oil of vitriol; (*d*) two or three times with water; (*e*) with caustic soda to remove free acid. The washed naphthalene is afterwards again distilled, when a small quantity of aqueous first runnings will come over, after which about 50 per cent. of pure naphthalene may be collected. This is run direct into barrels, and is ready for sale.

Naphthalene comes into the market in the form of white crystalline masses or (after sublimation) as thin rhomboidal scales. It fuses at 79° C., and boils at 218° C. The property which is of most concern to the gas maker, however, is its extreme volatility, as, unlike most bodies, it volatilizes far below its boiling-point. This will doubtless recall to the minds of many of those present unpleasant recollections of blocked mains, which this remarkable property has on so many occasions been responsible for.

Another process which is carried on in most tar distilleries is the extraction of carbolic acid. Carbolic acid or phenol is extracted by agitating the light-oil fraction with a solution of caustic soda. Carbolic acid is entirely soluble in the latter, forming what is known as carbolate or phenolate of soda; and when the agitation is finished, this settles to the bottom of the mixer, and may be run off quite free from oil. This carbonate of soda is run into a large iron vessel lined with lead, where it is subsequently neutralized with sulphuric acid. This causes the carbolic acid to separate and rise to the surface of the sulphate of soda solution, when it may be skimmed or syphoned off as required. The article obtained in this manner is known commercially as crude carbolic acid, and considerable rectification is necessary in order to obtain the pure article. Time, however, will not permit me to go into the various details in connection therewith.

Carbolic acid is extensively used as an antiseptic and disinfectant; its power of destroying the lower organisms being now fully recognized by the most eminent authorities. For this reason, carbolic acid, or preparations thereof, have been almost universally adopted by the medical profession for the antiseptic treatment of wounds. Carbolic acid is also largely used for the manufacture of picric acid and the picrates; these latter compounds being now required for the manufacture of lyddite and melenite explosives.

Discussion.

Mr. A. Wilson (Glasgow) said he would not try to discuss Mr. Wilson's paper; but he might state his reasons for adopting the class of exhauster referred to for the work he had to do. When he had to arrange for pumping the gas from Provan down to Dalmarnock, he looked round to see what would be the best way of doing the work, and he took an opportunity of investigating various plants that were doing similar work. He could not say he was at all favourably impressed with the suitability of any of them for his purpose. He found steam-driven exhausters pumping gas on to a district, and from holders into other holders; but, as most of the members knew, the pulsation due to these exhausters was usually very detrimental to the parties who had to use the gas. He also found exhausters driven by gas-engines. But they had the fatal objection, to his mind, of causing pulsations. He then examined several plants where blowers were in use, driven in some cases by steam-engines, and in others by gas-engines. He found that these blowers were doing good work up to a certain pressure. When, however, the pressure got up to a certain point, they did not seem to be nearly so effective. Where they were used solely for sending gas out into a district, to work against pressures of (say) 12 inches, they seemed to do fairly well. He, however, had to provide for something very much higher. As they would see by the tables submitted, they had, in sending gas down to Dalmarnock, a variation in pressure of perhaps 16 to 18 inches. But he thought it well, when putting down the plant, to arrange for a difference of at least 24 inches, in view of extra quantities of gas being required to be sent forward, due to increased consumption. When he approached the makers of various blowing plants, and asked them to give him a plant of sufficient capacity to work against a pressure up to (say) 24 inches, he was met by the statement that they had no blowers that could perform this duty. He could take one set of blowers, and put them down, then put down another set and work in series with them, and so increase the pressure; but it seemed to him that this was going to be a very complicated arrangement to adopt. The house, as they would have seen from the lantern slide, was built of fairly large size—in fact, it was arranged, in the first instance, for two sets of blowing plants, with counter-shafting, driven, he thought, by gas-engines. When he had considered the matter, and looked all round to see what he could get, it occurred to him that he might try Parsons' people, and see what they could do for him. The chief objection they raised was that what he wanted was a very small plant for them to manufacture. However, they considered the matter, and the result was the plant the members had seen on the screen. It was to deal with 750,000 cubic feet of gas per hour, against a pressure difference of 24 inches. As they saw by the tests, the exhauster amply fulfilled the guarantee; and a second plant had been put down as a stand-by, though up to the present it had not been required in that capacity, as they had never had any difficulty with the plant. The results obtained from the second plant were actually better than those they had with the first. The cost of the upkeep of the exhauster had been very low indeed. It had worked to his utmost satisfaction. He was very glad he went in for this particular style of exhauster, for it seemed to him to be eminently suited for the special class of work. Supposing they had to send gas into any district, or into all of them, the consumers would never experience any difference in the supply from what it would be if the gas came from the holder—the pressure was so steady. There was not the slightest pulsation, as they could readily understand from the construction of the exhauster and the velocity at which the shaft was driven. He was, therefore, very pleased to say that the exhausters had, up to the present time, cost them nothing for repairs; and the outlay for lubrication, attention, and other matters, was very low. It was quite different, in this respect, from other exhausters, where the quantity of oil required for the lubrication was somewhat high. With regard to the other paper, it seemed to him that the author quite understood his business, and had dealt with his subject very fully. He (Mr. Wilson) would like to ask him whether he found more naphthalene in the tar obtained in Scotland than in that got in England from the distillation of coal. There was very little trouble with naphthalene in Scotland. They found it to a slight extent in the scrubbers, but not in anything like the quantity to be met with in the South of England.

Mr. J. Webster (Provan) bore testimony to the excellent working of the gas-turbines. As for repairs, they were practically *nil*. No. 1 machine had run for two years, more or less, and the repairs on it had not amounted to 5s. The cost for oil was very little. The second machine had been running for two months; and when he asked that day how much oil had been used for it, he was told that none had been required. It was very easy to work. When gas had to be sent out, the man just turned on the turbine, and then he could go away. There was absolute safety in the working of it. Sometimes they were short of gas at Provan, and if they had plenty at Dawsholm they took advantage of it. At one side of the governor they might have 42-10ths, and at the other side 40-10ths; and the machine would run for hours with a difference of only 2-10ths, and without any variation. They could not do this with any other type of exhauster. They could draw out from the bottom lift of the holder with absolute safety. Of course, when they did this they ran at a slow speed; and then, perhaps in the afternoon, they would run down 900,000 cubic feet of gas per hour, going at full speed. Since the machines were put in, he had not seen any part of the inside of them. He had never had a single part out to see what it was like, never having had occasion to do it.

Mr. J. Lowe (Glasgow) said he could corroborate everything that had been stated about the turbines. The members would notice that the quantity of gas did not increase with the number of revolutions. This was to be expected. The same thing happened in the machine which occurred with the larger fans. When the pressure got up, the slip increased—the gas tended to run back to the other side of the fan. But where they had three fans or more in series, as in the case of the largest air-blowers, this was reduced in several ways. They had a smaller area, and there was less room for the slip to take place. Then there was the slip at the edges, from one side of the propeller to the other. Undoubtedly as the speed and the pressure increased, the slip increased. The same thing occurred in all steam-turbines. It

had been repeatedly stated, in favour of the steam-turbines, that initial condensation, leakage past valves, and all this sort of thing, and alternate heating and cooling of the cylinders, which occurred in the reciprocating engine, had been entirely done away with, and that therefore these machines should be much more efficient. Of course, in a large concern, the steam-turbine was a more efficient machine, although the record was at present held by the reciprocating engine at a certain pressure. But he wished to point out that there was a loss in the steam-turbine, due to considerable slip. The steam rushed through both the fixed and the stationary blades, and round the circumference, without doing any work; and also, if he might so express it, by the agitating of the steam it did not flow in a steady stream, but was caught and deflected between the fixed and moveable blades. These two causes accounted for the steam-turbine not having greater efficiency. In small sizes, the machine was not very efficient. It would take perhaps from 20 lbs. to 25 lbs. of steam to arrive at a certain speed with an ordinary engine; but a turbine took 47 lbs. On this account there was greater steam consumption. But it was really the commercial and not the theoretical cost which appealed to engineers.

Mr. D. Vass (Airdrie), speaking as a gas engineer, said he was disappointed to hear that the splendid machines mentioned would not be of much use in small works. He wished information on the point as to whether the turbine exhauster was not a separate part of the machine from that of the steam-turbine, and would therefore be applicable to any gas-works. They might only require to get a revolving shaft from some other easily adapted arrangement. If this was the case, what was to prevent them adopting some system of obtaining the motion, and affixing it to the exhauster? The turbine gave such a steady flow of gas that it would be of great service to them.

Mr. P. M'Dougall (Helensburgh) asked if some type of self-acting apparatus was fixed in connection with the turbine, so that, should a breakdown occur, it might come into use as a bye-pass. The value of the paper might have been increased if something had been said about the De Laval turbine with the Sturtevant blower, which had been applied in some places.

Mr. Q. Moore (Glasgow) asked how the cost of the turbine compared with that of the older exhausters.

The President said he had personally enjoyed the clear and extremely lucid way in which their, as yet, youngest lecturer had given his paper. It was extremely creditable to so young a member that he had tackled so difficult a subject, and had put it before them with such absolute lucidity, and with such a clear grasp of the principles involved. It was a great step from the days of Hero of Alexandria, who, about 120 B.C., really invented the turbine, to the present day, when they had the Parsons, De Laval, and other turbines; and that they in Glasgow should have the first turbine applied to gas-works was a very pleasant thing to contemplate.

Mr. Wilson, in reply, referring to the question put by Mr. Vass, said that in their case the engine was detached from the exhauster by a couple of bearings. The same thought passed through his mind, whether it would not be practicable to have the turbine driven by means of belts or otherwise; but then he thought that it might be a patent, and that they might not be allowed to use it as they pleased. The difficulty with other forms of power would be to get the high speed necessary. As the exhauster was only used intermittently, there were, of course, means for bye-passing the gas. In the case of the exhauster breaking down, the gas would not pass, and no harm would be done beyond the gas not being received at the other end. But as it would not be drawing away any gas, it would be the same as if the turbine were off. He had heard of the De Laval turbine, but not as working in conjunction with a Sturtevant blower; and he was sorry he could not say anything on this point. He did not know the exact cost of the turbine, but he mentioned that it was able to do more work than the eight other exhausters at Provan; and he might say that it only cost about one-third as much as all the other exhausters did. So they were getting more work done at one-third of the cost.

Mr. J. Lowe, speaking on the subject of Mr. Popplewell's paper, said the author had begun at the beginning of his subject, and had gone right through it. The tar-still shown was of the form, with the inverted bottom, most generally in use; but they had departed from this kind of still altogether in Glasgow. There was difficulty in getting the outlet-pipe into the centre. It made a better still, in his estimation, to have this pipe in the centre, because it was not liable to get filled up with hard pitch at the bottom, which required to be broken up with a pick, or in some other way, after the heavier fractions of the oil had been taken off. In Glasgow, some years ago, they made a still very much longer, with the bottom egg-ended, and with an outlet-bend for the passage of water, and the outlet-valve in the centre of the bench, not far from the fire. The valve was actuated by means of worm gearing. It was very useful to remember that the final temperature inside a tar-still was about 500° Fahr., which was very much higher than occurred (say) in a steam-boiler. There was no steam-boiler, with saturated steam, which had a temperature so high as 300° Fahr.; so that the pitch, when run off, was very hot. He had the design of the benzol-still which was used at Provan; but previous to that he had one of another still, which was erected at Dawsholm. They found by experience that there were several alterations which could be made upon the Dawsholm still, one of which was in the steam heating-coils. These used to extend to the top of the still; but it was found that, after the crude naphtha had been taken off, the coils above the surface of the liquid superheated the vapours coming off, and rendered the rectifying coils less effective than they should have been. One great difficulty in this class of plant was getting tight joints. Benzol vapour would go through almost anything; and the coil had to be, as far as possible, without an internal joint. He was looking up this subject some years ago, and was very much astonished to find that, long before the days of Murdoch, a patent was taken out for the distillation of coal, not for the purpose of making gas at all, but for making "cole tarre." The gas was the bye-product in those early days. The first plant for the carbonization of coal was erected at Culross, in Perthshire, by, he thought, Lord Dundonald.

Mr. D. Vass said in his early days he had some experience of tar distillation. In the works at Greenock Mr. Stewart introduced tar distillation many years ago. It was, however, only carried out so far as the crude naphtha. The experiments which had been shown to the members illustrated the advantage of belonging to an Association like theirs. In his young days, he had to ask the privilege of admission into works, here and there. He was always well received; but he could assure the members that they had a great privilege, compared with what he then experienced, in having such subjects brought before them as those they had been considering, and being able, in the course of a year, to ascertain what took him two or three years to get over.

Mr. Q. Moore pointed out that there were two critical points in the process of tar distillation—one at the beginning, when the distillate was coming through; and the other, and perhaps the more dangerous one, later on, when the free water was being taken off. There was very great danger of an eruptive explosion at that time. He thought the egg-ended still was the most convenient one to work. There was a prospect of the patent laws of this country being altered, even this year; and if this were done, possibly the coal-tar colour industry might come back to this country.

Mr. C. Ratcliffe (Glasgow) remarked that the costs of working came out about the same, whether the still were a 10-ton or a 30-ton one, though he considered that by making a big charge and working off a quantity there should be a saving.

The President said Mr. Popplewell was to be congratulated on showing them the form of the fractionating column. The progress of the distillation of coal tar had been very great indeed; and he was glad to hear that the colour industry might come back to this country. It was one of the standing disgraces that it had left us so entirely as it had done. He was glad to see that the Gaslight and Coke Company were making a good many dyes; and also that a firm in Manchester were doing the same. It was rather a curious fact, as pointed out by Mr. Lowe, that the coal-tar trade was started in Scotland; and he hoped that in the future Messrs. Brotherton, whose representatives were with them that night, or some other firm, would start the making of coal tar colours in Scotland, where there were a great many firms engaged in dyeing. It would be of great advantage to them.

Mr. Popplewell, in reply, said it had been a great source of pleasure to him to listen to the remarks which had been made on his paper. They did not find any great difference in the quantity of naphthalene contained in Glasgow tar and that contained in Lancashire and Yorkshire tar; but he believed the tars produced in London and the districts in the South contained a very high percentage of naphthalene. One disadvantage of the egg-ended tar-still was having the run-off cock in the centre. This still was bound to be supported by brickwork in the centre, and the run-off cock would require to be protected. This detracted from the heating surface. They did not find any difficulty, in their English stills, in regard to pitch having to be dug out with picks, or anything of the kind. The pitch ran off quite clear from the bottom of the still.

A vote of thanks to the readers of the papers having been accorded, the meeting terminated.

Mr. F. H. Armstrong, Solicitor, has been appointed Secretary and Treasurer of the Hawick Gas Company, in succession to the late Mr. J. R. Carmichael.

Ex-Bailie James Craig, of Kilmarnock, the Managing-Director of Messrs. J. & M. Craig, Limited, manufacturers of fire-clay goods, died on the 6th inst., at the age of 85. The business was commenced by his father, Mr. Matthew Craig, in 1828.

At the meeting of the Institution of Civil Engineers last Tuesday, it was announced that Mr. George Garson, B.Sc., who is associated with the water supply of Melbourne, had been transferred from the class of associates to that of members.

In the "Journal" for the 7th of August last, we announced the appointment of Mr. W. H. Adams, of Gosport, as Engineer and Manager of the Bilston Gas Company, in succession to the late Mr. J. S. Reeves. The deceased gentleman also held the position of Secretary; and this was last Friday conferred upon Mr. Adams.

It is announced that Mr. D. F. Schloss, who has been engaged in the Labour Department of the Board of Trade, has been appointed Director of the census of production, to be compiled under the Act of last session, the object of which, as mentioned elsewhere, is to obtain a measure of the total productions of the factories and workshops in the United Kingdom.

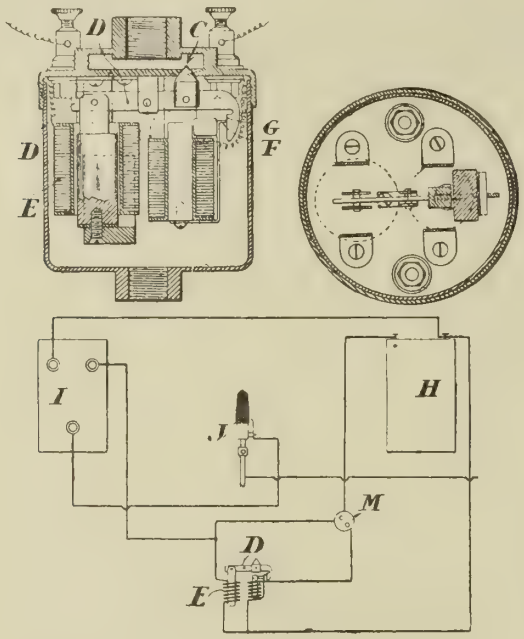
REGISTER OF PATENTS.

Electrically Operated Gas-Burner Tap.

HACKING, A. E., of Nottingham.

No. 248; Jan. 4, 1906.

This electrically operated gas-valve and its operating mechanism is enclosed within a gas-tight chamber between the gas supply and the burner, and in which the valve is opened by an electro-magnet—retained in the open position by a spring catch and closed by the release of the catch by a second electro-magnet. An electrical solenoid and its core are used to open and close the valve by and through power lever arrangements, which operate to "effectively prevent any possibility of the valve sticking or not closing properly." The core of the solenoid hangs from the one end of a first-order lever, at the other end of which a valve head is pivotally connected. A known form of automatically operating catch is combined with the aforesaid features to hold the valve open.



Hacking's Electrically Operated Gas-Burner Tap.

The gas-tight box shown has an inlet at the bottom and an outlet at the top; the same being placed between the gas supply and the burner. Between the inlet and outlet is an automatically acting gas-valve C, comprising a seating and valve head carried by a first-order lever D, and the seating provided in an intermediate wall of the chamber. The lever rocks on a stationary fulcrum, and has hanging from its one arm the core of a solenoid E. On its other arm the lever carries, pivotedly, the valve-head, and is provided with a catch detent. The solenoid core is extra weighted to normally close the valve and cut off communication between the inlet and outlet. The solenoid, when the proper switch is momentarily closed, sucks the core upwards in the direction of the arrow, and thereby rocks the lever to take the valve-head from its seating and establish communication between the inlet and outlet. The catch detent is, by the rocking of the lever, brought opposite an automatically operating catch F, which instantly engages the detent and holds the lever with the valve open until another switch is momentarily closed to pull the catch out of the detent. The catch F is on the end of a limb spring, supported by an electro-magnet; the limb spring carrying an armature adapted to be attracted by the electro-magnet. The electro-magnet acts only to pull the catch from the detent—the catch, by the power in the limb spring, automatically engaging the detent. When the valve C is closed (as represented), the catch bears against an edge G of the adjacent arm of the lever, which serves as an abutment in guiding the catch to the detent.

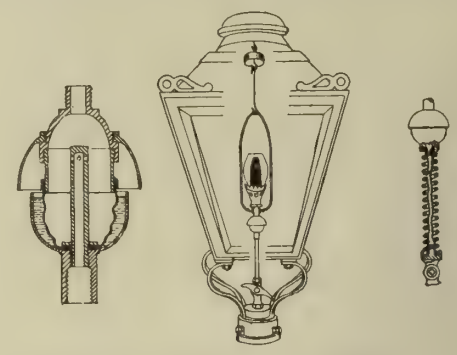
The solenoid, the electro-magnet, the valve, and the automatically acting catch are all within the gas-chamber, between the inlet and outlet, and the bobbins of the solenoid and magnet are both connected up in electrical circuits controlled substantially as represented in the diagram. Here H is the battery, I is the sparking coil, J the gas-burner with its sparking devices, and M a two-button switch, E being the solenoid and D the lever. If the upper button on M is pressed, the solenoid E and the sparking coil I are put into circuit. If the lower button is pressed, the electro-magnet is operated without the coil being put in circuit—it being understood that only one button on M is operated at a time.

Anti-Vibration Suspenders for Incandescent Gas-Burners.

CURTIS, G., of Hunslet, Leeds.

No. 2653; Feb. 3, 1906.

According to this invention, a tube is formed of Persian cloth, chamois leather, or other material having a similar high degree of flexibility, which may be rendered impervious to gas without spoiling its flexibility, and is not injuriously affected by the gas passed through it. The lower end of the tube is fitted (as shown) in a cup or cylinder fully open at the top, having a smaller opening in the bottom connected to the gas-pipe, and into which opening the end of the tube is fitted gas tight. The gas-pipe projects some distance up the flexible tube; being closed at the top, but having side openings at the top so as to be drip-proof. The bottom cup is filled, or nearly so, with glycerine, or



Curtis's Anti-Vibrator for Gas-Burners.

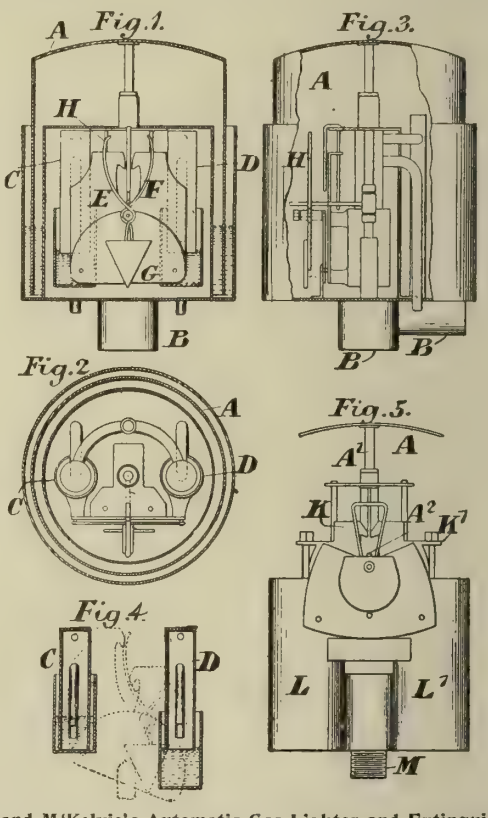
a mixture of glycerine and water, to protect the greater part of the tube from the action of the weather. To the lower part of the burner, to which the upper end of the flexible tube is connected, there is attached a cup or cylinder with the open end downward, and suitably larger in diameter than the bottom cup, so as to fully protect the latter from the wind and dust, while allowing all the vertical and lateral play or swing which may be imparted by vibration to the one or other, or both, without bringing the two cups into contact.

Automatically Lighting and Extinguishing Lamps.

ROSIE, J., and M'KELVIE, J., of Edinburgh.

No. 3148; Feb. 9, 1906.

This invention relates to the automatic lighting and extinguishing of gas-lights by varying the pressure in the mains, so that, simultaneously with the extinguishing of the gas-burner the pilot burner is lighted, and simultaneously with the extinguishing of the pilot burner the gas-burner is ignited.



Rosie and M'Kelvie's Automatic Gas Lighter and Extinguisher.

Fig. 1 is a sectional elevation of the apparatus. Fig. 2 is a sectional plan. Fig. 3 is a sectional elevation at right angles to fig. 1. Fig. 4 is a detail. Fig. 5 is an elevation of another form of the lighter and extinguisher.

The apparatus consists of a small gasholder A, the dome of which is weighted to remain down with abnormal pressures in the main; while by increasing the pressure in the main, the gas is lighted or extinguished. It is provided with an annular space into which the depending portion of the holder is inserted—the space being provided with a mercurial seal. Gas is conducted through the pipe B upwards into A and also into the gas-sealing chambers C and D, as shown more particularly in fig. 4—a section of the sealing-chambers. When the gas enters A, through the pipes B, it is also conducted into branch pipes communicating with the sealing-chambers C and D; and the arrangement is such that the pressure of gas entering A from the mains causes the bell to ascend. In so doing, one or other of the small supply pipes is unsealed, and gas is allowed to flow out of one of the sealing-chambers C D—thence, through the pipes, to either the pilot light or the gas-light proper. The small pipes referred to depend within the sealing-chambers C D, shown more particularly in figs. 1 and 4. It will be observed that in fig. 4 the opening of the left-hand pipe is sealed; therefore there is no gas supply through it. Gas, however, is being supplied through the other pipe by reason of the end of it being unsealed.

When the sealing cups are in the half-position, gas for the moment enters both the pilot-pipe and the gas-light pipe, so as to allow one light to ignite the other before cutting off the supply to either of the two pipes.

To actuate alternately the sealing and unsealing of the pipes, there is connected to the dome of A a rod, which is elevated and lowered by the action of the dome of the holder. This rod has attached to it a radial arm, which is caused to rise and fall; and, in doing so, it engages with one or other of the arms E F, at their hook-shaped ends. These arms are connected to sealing cups E and F_1, so that they are capable of raising and lowering the cups, which are provided with a mercurial seal Attached to the bottom of the arms E and F is the half-disc G, pivoted to a bracket secured to the bottom of the gasholder, and shown more particularly in dotted lines in fig. 4.

Secured to the top of the half-disc G is a pin projecting out from its face; and loosely pivoted to the pin is the wire tumbler H, which is provided with a counterbalance, the arrangement of which and the tumbler H is such that the counterbalance always keeps the tumbler in a perpendicular position irrespective of the position of the half-disc G by which it is carried.

Fig. 4 shows the relative position of this tumbler and counterbalance with the half-disc G. Depending from the fixed bracket shown in fig. 1 (and more particularly in fig. 3) is a guide-rod, to keep the radial rod in position while it is elevating one of the arms E or F. The tumbler H performs the function of altering the position of this radial rod, so that it engages with the hook-shaped portion of one or other of the arms E F—that is to say, the bottom of the tumbler where the rod is resting in (as shown in fig. 1) is transferred to immediately below the hook-shaped portion of one of the arms E F, or, in other words, the rod, as it descends, follows the contour of the inside of the tumbler H. This alteration in the position of the tumbler being effected, as already described, by altering the position of the half-disc G by which it is carried.

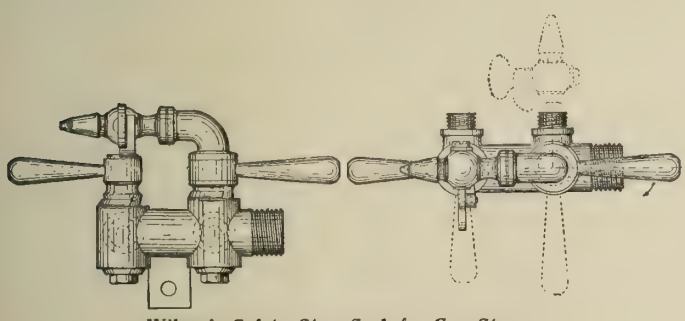
Fig. 5 is a modification showing another way of actuating the sealing cups within the sealing chambers—that is to say, the patentees dispense with the arrangement of arms E and F, figs. 1 to 4, and actuate the sealing cups from the centre of the sealing-chambers L L^1. The method of actuating the sealing-cups is effected as in figs. 1 to 4; but the arrangement is different. Here A is the dome of the gasholder, to which the rod A^1 is connected—being provided with a guide (not shown) in the lower portion of the sealing-chambers L L^1. This rod carries a radial rod which actuates either one or other of the arms K K^1 connected to the rods of the sealing cups. The action is therefore such that an upward and downward motion to either one or the other of the arms K K^1 is imparted by the radial rod by engaging with one or other of the hooked ends of the arms K K^1. The governing of the radial rod (that is to say, the guiding into position for engaging with one or other of the arms K K^1) is effected by a segment which has a counterbalance pivoted to it; the segment being pivoted to the arms K K^1.

Safety Stop-Cocks for Gas-Stoves.

Wilson, W., of Armley, near Leeds.

No. 13,161; June 7, 1906.

This invention (relating to safety cocks or valves for gas-stoves, water-heaters, or the like) has for its object to provide a valve or cock with a bye-pass arranged in such a manner that, until the valve spindle on which the bye-pass is mounted is turned towards the burners, the gas supply will not pass, and so that the valve cannot be operated until the bye-pass tap is turned on; the bye-pass tap being provided with a catch arranged so that the catch will be in contact with a suitable stop until the tap is opened.



Wilson's Safety Stop-Cock for Gas-Stoves.

The working of the stop-cock will be clear from the accompanying engraving—a front elevation showing the improvement applied to a fitting for a duplex burner, and a part sectional elevation of the valve and bye-pass.

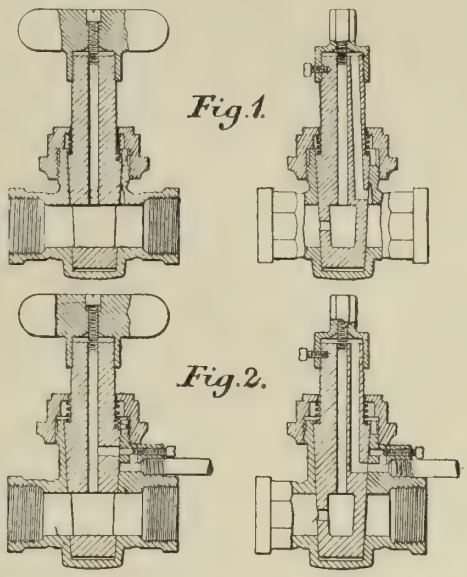
Bye-Pass Gas-Burner Taps.

Bartlett, F. G., of Bristol.

No. 15,663; July 11, 1906.

This invention applies to cases where the bye-pass gas goes to the main burners, as well as where the bye-pass gas goes to pilot lights in more or less close proximity to the main burners or in them.

In cases of the first kind (see fig. 1), the bye-pass is effected, from the inlet side of the tap plug to the outlet side, through the plug, towards the lower end of which is a bye-pass inlet port, which opens into the main gas-way of the plug. Thence, when the bye-pass is open, the gas flows up through a passage in the plug to a space below the crutch cap; the amount passing being regulated by the usual controlling screw passed down from the top of the crutch. The regulated quantity descends a second passage in the plug and passes out by a port in the plug side into a cavity or channel in the tap body, and which opens into the main bore of the tap on the outlet side of the plug. By turning the plug through a quarter-of-a-circle (the range of turn being governed by a stop pin), the bye-pass is closed and the main gas-way through the plug is open to the main pipe.



Bartlett's Bye-Pass Gas-Taps.

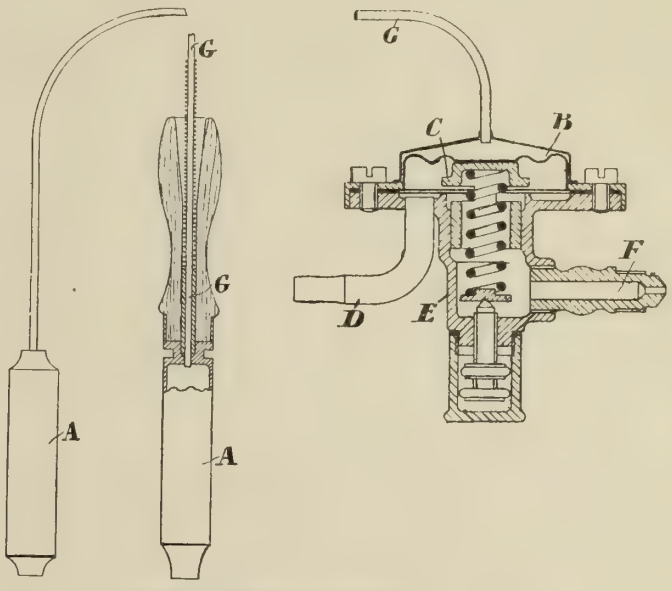
As applied to cases where the gas for the burners is supplied through the main, and the gas for the pilot lights is supplied by way of the bye-pass (fig. 2), a bye-pass main pipe is provided, in going to which the bye-pass gas takes one of two ways. It goes by one way when the tap is closed, and by the other when it is open. An additional regulating device is provided for controlling the bye-pass gas in the course taken by it to the bye-pass main pipe when the tap is opened to the main burners.

Regulating Device for Gas-Stoves.

Junkers, H., of Aix-la-Chapelle.

No. 16,323; July 19, 1906.

This device for the automatic regulation of gas-cooking apparatus is of the type in which the supply of gas is regulated by the variations in pressure of a gaseous or liquid medium when subjected to the thermal influence of the heated vessel or its contents, and is characterized by the pressure being transmitted from a sensitive cap through a flexible metal pipe permanently connected at one end to the cap and at the other end to a valve-chamber, within which is a metal diaphragm or like pressure member enclosing the medium in a permanent manner and freely communicating its variations in pressure to the valve. The flexible metallic tube is formed with helical grooves or is covered with a protective or non-conducting sheath, with or without a handle of non-conducting substance.



Junkers' Automatic Regulator for Gas-Stoves.

The operation of the device (shown) is as follows: Under the influence of the heat of the vessel itself or its contents being heated, the substance contained in the sensitive cap A expands, vaporizes, or otherwise increases the pressure within the cap and tube. This pressure is transmitted to the diaphragm B, which, by means of the valve C, throttles or controls, to a greater or less extent, the quantity of gas passing from the pipe D into the casing E, and thence, through the pipe F, to the cooking apparatus. This throttling takes place in such a manner that when the temperature of the vessel or its contents is lower (and consequently the pressure in the cap and tube is less) more gas passes to the burner; but when the temperature is higher, the pressure is greater, and a smaller quantity is allowed to pass. The supply is thus automatically regulated by the temperature of the article being heated.

Instead of the diaphragm B, some other device capable of movement in a similar manner under the influence of pressure can be used—as,

for example, a Bourdon tube or the like. Owing to the sensitive cap A being connected to the cover by a thin flexible metal tube G, not only can the cap be easily manipulated, but, owing to the absence of rubber connections or other destructible parts, the device has "great durability, and is consequently reliable."

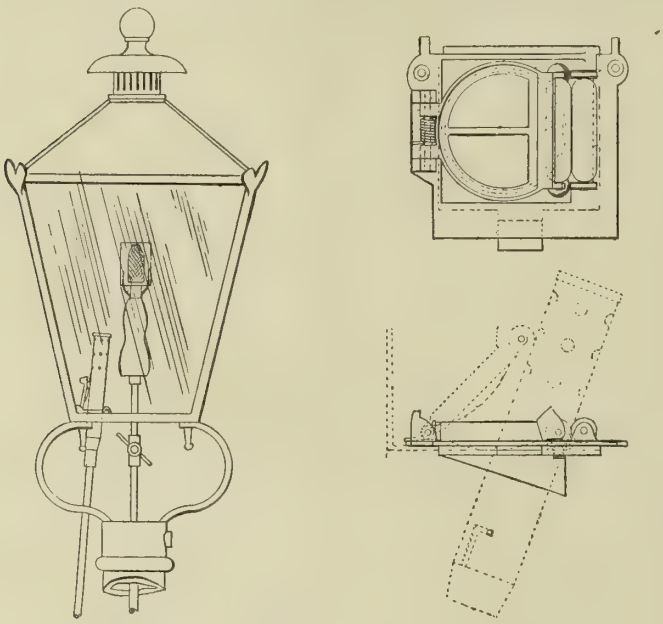
As a rule, the cap A is formed of metal, so that the tube G can be soldered to it. If made of (say) glass, a thin platinum tube can be used to form the connection—the glass being melted around the platinum, and the flexible tube soldered to it. In some cases, the single thin metal tube is replaced by a series of parallel thin tubes of small diameter, so as to still further increase the flexibility.

Street and Other Lanterns.

EDGAR, W., of Hammersmith.

No. 15,970; July 14, 1906.

This invention relates to gas-lanterns in which incandescent mantles are used, and which possess the following characteristics: The door is fitted on the outer frame of the lantern and is provided with a roller on its free edge; one edge of the opening is provided with a roller; a cushion is provided for the door to fall on; and the door is spring controlled. The object of the invention is to ensure a proper passage for the torch through the opening, without fear of it catching against the framing of the lamp, and to ensure that the door shall be properly closed after each withdrawal of the torch. The patentee also claims to have constructed "an improved buffer or cushion, or buffers or cushions, adjustable or not, for the door to fall on, and so prevent breaking of the glass or sudden shocks being imparted to the mantle."



Edgar's Street-Lantern for Incandescent Lighting.

The invention will be understood from the accompanying illustrations—a plan of one form of door and its frame; a side elevation showing the usual lighting torch inserted; and an elevation of a lamp and its column with a torch inserted to light the gas.

Price-Varying Mechanism for Prepayment Meters.

WILSON, G., of 's Gravenhage, Holland.

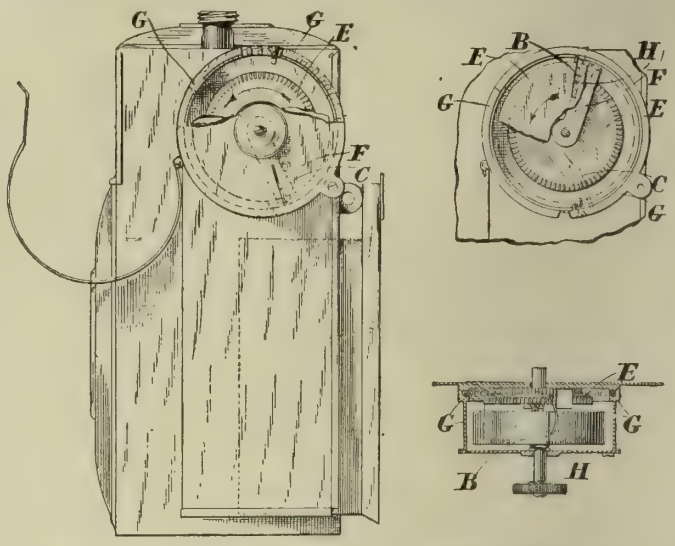
No. 17,225; July 31, 1906.

This mechanism comprises the combination with a movable member (into which a coin is inserted) and a toothed member (adapted to be locked to the movable member by the coin) of a shield moving with the movable member and preventing such locking until arrested by a stop. The stop is adjustable in position for varying the price of the commodity being measured.

The illustration shows a side elevation partly in section of one embodiment of the invention attached to a gas-meter, a side elevation, partly in section, of the price-varying mechanism, and a plan, partly in section, of the same.

The meter drum is provided with a pocket B, into which a coin may be inserted through a slot C in the casing. A crown-wheel E faces the drum, and is connected to the "crediting" part of the meter—*i.e.*, the part of the mechanism which has to be moved through a certain amount to allow the gas to pass through the meter and be registered. This "crediting" mechanism may be of any desired type. Between the drum and the crown-wheel is a shield F, provided at its end with a projection which moves over the crown wheel. It is also provided with a spring on the side facing the drum. Surrounding the crown-wheel is a ring G having a number of screw-threaded holes in it, into one of which a stop is screwed. An extension of the ring G forms a casing for the drum and crown-wheel. A stop is provided on the drum and a stop on the ring. The drum is also provided with a stop which engages with a stop on the ring surrounding it, for the purpose of preventing its complete rotation. Within the drum a spring H is provided, which crosses the pocket B and moves through slots cut in its side walls.

The shield and drum being in the position shown, a coin is inserted in the pocket B. In forcing the coin into the pocket, the spring H is first moved to allow it to pass and then partly returns. The coin is therefore pressed against the shield F by the spring H, aided by the spring on the shield F. The drum is then rotated in the direction of the arrow, the shield held by the pressure of the coin moving with it. After this the coin moves on with the drum, and is pressed by the spring H into engagement with one of the teeth of the crown-wheel E; and on continuing the rotation of the drum, the crown-wheel is rotated until the coin-pocket arrives above a slot, when the coin, aided by the action of the spring H, falls into the money-box below. Before another coin can be inserted, the handle, and with it the drum, must be turned back on account of the stops—the stop on the drum serving to bring the shield back into the position shown. By moving the stop in the ring G, it is obvious that the amount through which the crown-wheel E is rotated on the insertion of each coin can be varied, and therefore the amount of gas supplied to the consumer. The stop prevents the shield F moving downwards away from the position shown.



Wilson's Price-Varying Mechanism for Prepayment Gas-Meters.

The shield F, in addition to serving the purpose described, also prevents the meter being fraudulently operated by a strip of metal or a wire.

The mechanism may conveniently be encased as shown—a circular plate covering the prepayment mechanism. The casing beneath, into which the money-box can slide, is hinged so that it can be moved to cover the ring G, which may be locked to the hasp shown.

Measuring Gas Pressures.

BRUYN, P. DE, of Düsseldorf, Germany.

No. 24,311; Oct. 31, 1906.

This invention relates to apparatus for measuring gas pressures where the gas pressure acting under a bell provided with a float causes the bell and float to rise to a height corresponding to the pressure. In such apparatus as hitherto constructed (which are based on hydrostatic action, and which comprise a bell and float), intercommunicating bodies of liquids have been employed for their sealing and support. This has the result that variations in the level of one body of liquid or in the gas pressure acting upon the body of liquid entail corresponding variations in the level of the other body of liquid, so that an alteration in the statical conditions of one portion of the apparatus has influenced the other part. But in the apparatus according to this invention, the bell and float are arranged to dip in bodies of liquid completely separate from each other, so that mutual influence of the levels of the liquids on each other is avoided, and the "indications of the pressures are rendered more steady."

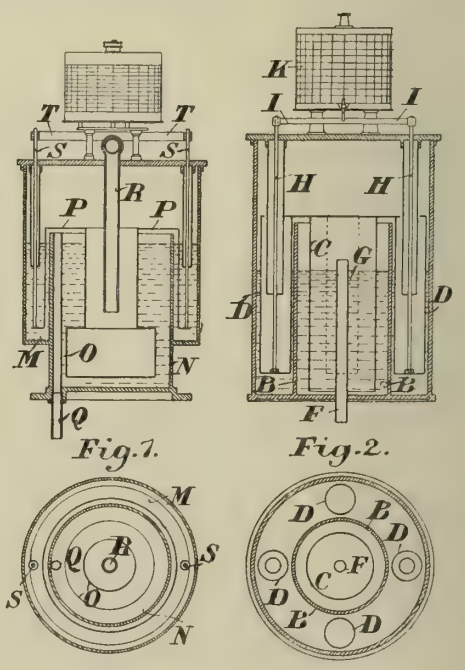


Fig. 1. Fig. 2.

De Bruyn's Pressure Recorder.

The illustrations show two practical constructions of apparatus for measuring gas pressures according to this invention—a central vertical section and a horizontal cross section.

Referring first to fig. 2, the (preferably) cylindrical vessel is divided by a cylindrical inset vessel B into two chambers completely separated from each other. Both chambers are filled to a certain level with liquid; and in the space enclosed by the vessel B there dips a bell C, which is connected to floats D. A tube F extends through the bottom of the vessel up beyond the level G of the liquid, and leads the gas (the pressure of which it is desired to measure) under the bell C. The movement of the floats is transmitted by rods H I to recording apparatus K in the usual way. The extent of movement of the floats is dependent solely on the greater or less buoyancy of the floats that is produced by the variation of the gas pressure acting under the bell C; the liquids in the vessels having no influence on the indication of the pressure.

The construction shown in fig. 1 is specially adapted for measuring differential pressures. In this construction the measuring vessel is similarly composed of two concentric vessels containing respectively bodies of liquid M and N completely separate from each other. The float O is immersed in the inner vessel; while the outer vessel M contains the bell P that is fixed to the float O. One gas supply enters below the bell P through the pipe Q, and the other passes above the bell through the pipe R. Rods S, mounted on the bell, extend through the top of the outer vessel, and transmit, by means of the cross piece T, the movement of the float O to the recording apparatus.

Temporarily Plugging Gas-Mains.

WHITE, J. H., of Jersey City, U.S.A.

No. 16,780; July 25, 1906.

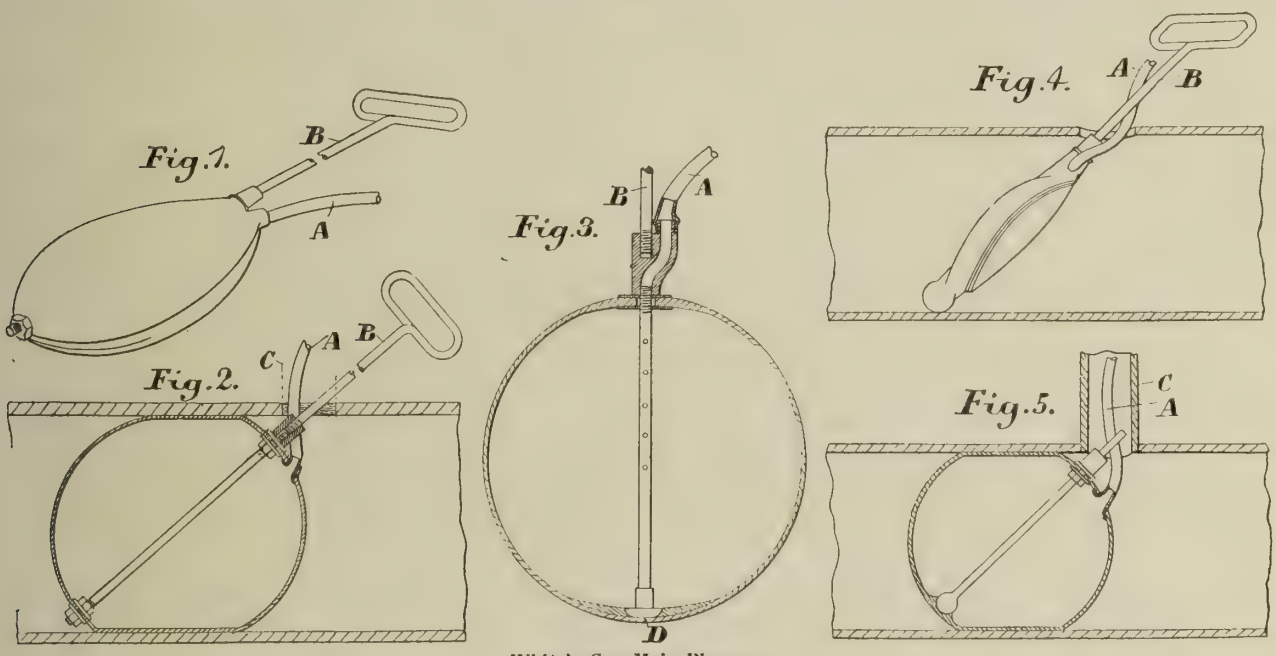
This invention relating to means for temporarily plugging gas-mains has for its object to put the bladder employed for the purpose fully under the control of the workman, and render it perfectly manageable throughout the inflating operation.

Fig. 1 is a perspective view of one form of the temporary plug—the bladder being shown deflated—while fig. 2 is a sectional view showing a main perforated and plugged by the device. Fig. 3 shows the preferred form of the bladder. Figs. 4 and 5 show the device when first inserted into the main, and after inflation in the main and the adjustment of the testing tube.

In operation, the thin and flexible material of the bladder is wrapped around the stock, which is then thrust through the perforation in the main, then, by giving the handle the proper inclination and thrusting it in until it comes in contact with the bottom of the main, the proper position is given to the bladder, which is then filled by the workman through the tube A, and caused to fill the main tightly. The tube is then temporarily sealed, and the handle B may then be unscrewed without disturbing the plug (although for some purposes it is unnecessary to remove the handle), and a short pipe C screwed in (as indicated by dotted lines in fig. 2) when the apparatus is being used for testing the main for a leak.

In the form seen at fig. 3, the stock is in the form of a perforated tube for the passage of air, and is provided at its lower end with a cap, having a knob portion to engage the pocket D. The wall of the bladder is preferably thickened at the lower end to compensate for the extra wear. The threaded sleeve or head at the top of the bag makes the construction more compact, so that it can be readily thrust through a relatively small perforation in the main.

The bladder is of thin material, which has no resiliency, and is limp and flabby and without form when not inflated, so that it lies against, and may be wrapped closely around, an interior guiding stock. Substantially all the plugging and inflating portions lie within the circumference of the main or are housed within the upright tube C when the main is being tested. This latter object is accomplished by having the stock controlled while inserting the bladder by an exterior handle B which is readily removed from interference with the adjustment of the test tube C, after the bladder is properly inserted and inflated; while the flexible inflating tube A is housed inside the tube C as shown in fig. 5.



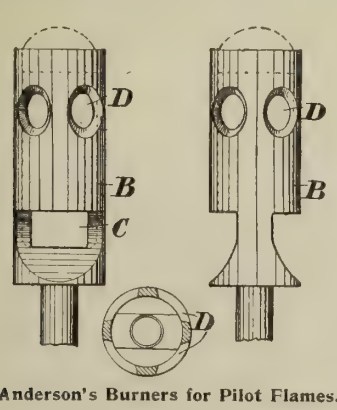
White's Gas-Main Plugger.

Burners for Pilot Flames.

ANDERSON, J., of Edinburgh.

No. 24,449; Nov. 1, 1906.

The object of this invention is to provide a pilot burner which will not be blown out by currents of wind when applied to lamps in exposed situations. The burner comprises a casing closed at the top for the flame, and provided with air supply holes at or near the point where the gas enters the casing, and also with additional side perforations near the upper end of the casing through which the gas from the main burner is ignited.



Anderson's Burners for Pilot Flames.

As shown, the gas is led to the bye-pass or pilot flame by a pipe having its exit in a casing B, provided with holes C, for the purpose of admitting air to the burner. The casing is closed at the top, and at the upper end are a number of vent holes D, preferably countersunk, "as a sharp outer edge has a tendency to cut off the flame from the upper holes when the wind blows upon it."

APPLICATIONS FOR LETTERS PATENT.

20.—DUNPHY, A. L., and TYSOE, J., "Inverted Burners." Jan. 1.

134.—CLERC, E., and BIDAULT, E., "Lighting and extinguishing gas." Jan. 2.

200.—M'MULLEN, J. A., "Gas-producers." Jan. 3.

203.—GLOVER, T., "Gas-meters." Jan. 3.

230.—DUNPHY, A. L., "Gas-governors." Jan. 3.

240.—WIGLEY, P., ARCULUS, G. N. & E. A., and WARRY, J., "Incandescent and other atmospheric gas-burners." Jan. 4.

270.—WILLIAMS, C., "Incandescent and asbestos gas-mantle." Jan. 4.

277.—PIRRIE, J. M., "Gas cookers." Jan. 4.

Suicides by Gas.—Poor health, together with business and financial worries, were apparently the causes of the suicide of John H. Parker, a company promoter and mining agent. Deceased, who arrived from the Transvaal some months ago, last Saturday week engaged a bedroom at a Kensington boarding-house. No answer could be obtained to repeated knocks at his door next morning; and when the room was entered, he was found lying dead on the floor with his head enveloped in his overcoat. He had cut the lead gas-pipe leading into the room, and had bent the open end of the pipe into his mouth. In the case of a Liverpool woman who committed suicide by placing in her mouth one end of a tube, the other end of which was connected with an open gas-bracket, her servant stated that she saw her mistress reading an evening paper which contained a report of an inquest held in regard to a similar death. The woman's husband stated that at one time she was in an asylum.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

The "Faking" of Photographs of Lighting Installations.

SIR,—We notice in your issue of Jan. 1 some remarks (p. 31), concerning "faked" night views, which we feel tempted to comment on.

As the firm who introduced night photography of gas installations, we should like to protest against the implication that, to be *bonâ fide*, a photograph must show the characteristics of your reproduction on p. 31. Such remarks are admirably calculated to strengthen the prejudice which your writer seems to share against an intelligent treatment of these subjects. The talk of "faking" in this connection is utterly misleading, as implying a false or unreal effect. The object of photographing a place by night is to show what it looks like—not to obtain certain records of blemishes incidental to the imperfections of the photographic plate. We have never understood, therefore, why men who usually know what they want should insist upon multiplying these meaningless splashes of light, which have no optical existence, and can only serve to confound one's ideas of the illuminating effect actually obtained.

If it is thought that such halations are a hallmark of "genuineness," we must beg to differ. It would be quite easy (both in the photographic printing and in the process-block making) to "improve" everything else and leave the halations in their virginal state. [As a matter of fact, this is what we have often seen done with inferior views of this kind.] We might as well say that a face was "faked," because certain blemishes emphasized by the photographic image were removed or subdued. It is as unintelligent to apply the term to a process which aims at nothing but counteracting the shortcomings of the plate, but absolutely introduces no feature which does not exist in the original.

Brixton, S.W., Jan. 7, 1907. BORUP BROS.

Hathersage and its Gas-Works.

SIR,—We notice a letter in the "JOURNAL" for the 8th inst., from Mr. T. Brown, and are much surprised at the statements he makes, which are not in accordance with the facts.

We deny having used any No. 12, 13, or 14, gauge sheets where No. 10 gauge were specified; but we do admit that some No. 11 gauge sheets did inadvertently get into the cupping. But these were replaced within a week of being found wrong; and our books will show that the sheets to replace were ordered from the makers some time before Mr. Brown called our attention to it. This shows clearly that it was not wilfully done.

This, however, was not the cause of the delay, as stated in your first short paragraph. It was caused by the choice of site, and alterations to specification necessitated thereby.

We do not wish to debate the matter through your columns, unless forced; the proper place for this being before the Directors.

Dewsbury, Jan. 12, 1907. J. FIRTH BLAKELEY AND CO.

Disposal of Ammoniacal Liquor in Small Works.

SIR,—With reference to Messrs. Biggs, Wall, and Co.'s letter in your issue of the 8th inst., I am pleased to hear that they are able to obtain such good results in practice. With a guarantee as to cost of production by their plant, also a further guarantee that the sulphate made shall realize an average net price of £12 per ton, "Gas Manager's" difficulty should be solved.

Jan. 12, 1907. S/A.

Loughborough Gas Undertaking.—The profit on the Loughborough Gas-Works for the half year to September last was £1844, which was somewhat less than that for the corresponding period of the previous year. This, said Alderman Bumpus, when presenting the accounts, was in the main owing to the fact that the expenditure was increased by £200. They usually put by certain items for repairs, which cost about this sum; and the amount was not included in the accounts a year ago, which made them look £200 worse. Allowing for this, the result was practically the same, which he thought was very satisfactory, seeing that they had had to face a considerable amount of competition from the electrical undertaking. The greatest help towards this result was occasioned by the number of prepayment consumers, who had increased in the six months by 211. There was also a slight increase in the ordinary cooking-stoves. This was a valuable aid towards meeting the loss caused by the electricity undertaking. The increase in the gas sold was 3¾ per cent.

A Defect in the Gas-Cooker.—The writer of "Notes on Gas Lighting" in the current number of the "Ironmonger" calls attention to a complaint recently made by one of the medical papers that the gas-stove cannot take the place of an ordinary coal-fired kitchen range as a refuse destructor, and says: "The common kind of gas-oven cannot well be employed to burn waste material; and in this particular respect it is undoubtedly inferior to the closed coal range. Many owners or hirers of gas-cookers keep their coal kitcheners alight in the winter, partly for the sake of a hot-water supply, and partly because the hot chimney and the convection from the plate help to warm the house. The advantages of the gas-cooker are most manifest in the summer, when there is less demand for hot baths; and the summer is just the time when periodical cremation of refuse is most desirable. If manufacturers could design some nice little crematorium fired by gas, in which egg-shells could be dissipated without notifying the whole neighbourhood, people with delicate nostrils and a sense of their responsibilities as citizens might perhaps come forward and purchase it freely."

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Jan. 11.

(*Before Mr. Justice* KEKEWICH.)

In re the Kent County Gaslight and Coke Company, Limited.

Two further motions by shareholders in this Company, asking to be relieved of their shares and get back the money they had paid, came before the Court to-day.

In the first case, Mr. BYRNE moved on behalf of Mr. Joseph Brierley, who said in his affidavit that he delayed taking proceedings until November by reason of the circulars he received from the Company, by which he was misled until he saw a report of Mr. Justice Joyce's judgment.

Mr. KIRBY, on behalf of the Company, submitted that the applicant ought to have taken proceedings earlier, and that in any case the presentation of the petition to wind up before the present motion was launched was a bar to its success. In support of this, he cited the case of *Tennant v. City of Glasgow Bank*, in the House of Lords. It was obvious, he said, that a winding-up order would be made, probably on the 21st inst., when the petition came on; and his Lordship would then have no jurisdiction in the matter.

Mr. BYRNE said his Lordship had jurisdiction now; and, even after winding-up, applications for rescission of contract could be made with the leave of the Court.

Mr. LAWRENCE, K.C., who appeared for the applicant in the other motion, also urged that no injustice would be done to any one by the order being made. If execution were issued upon it, it could be stayed pending the hearing of the petition, as had already been done in one case. It was by no means certain that an order would be made on the petition, as the Company were resisting it.

After some further observations by Mr. KIRBY,

Justice KEKEWICH, in giving judgment, said that, apart from the point raised as to the winding-up petition, the case was similar to those which recently came before him; but it was the weakest of them all in respect of the delay in taking proceedings. Still, though the applicant had, he thought, been partially blind, he did not think he had wilfully shut his eyes. He said in his affidavit (and he had not been cross-examined) that early in September he received a circular and telegram which satisfied him that Mr. Darwin was going to be a Director of the Company, though where the satisfaction came from it was difficult to see. Still he (his Lordship) could not say that his case would not come within the same rule as the previous ones. With regard to the presentation of the petition, he at first thought he ought not to make any order which might throw the least difficulty in the way of the Judge who dealt with the winding-up petition doing full justice between the parties; and he understood from Mr. Kirby that a winding-up order was inevitable. He now learnt that it was a contributory's petition; and if the majority of the contributories wished the Company to go on, a winding-up order need not be made, and he could not assume that it would be made. On the whole, therefore, he did not think he should do any real mischief by making an order, particularly as any proceedings under it could be stayed pending the winding-up. The case cited had no application, because there the Company was admittedly insolvent; but here there was no evidence of insolvency, and no creditor was petitioning. He should, therefore, make the same order as in the previous cases.

Mr. LAWRENCE said the other motion was on behalf of ten shareholders who joined together, each of whom had made an affidavit stating the circumstances under which he applied; and no notice had been given to cross-examine any of them. He therefore asked for the same order.

Mr. KIRBY having no further objection to offer, the order was made.

Liability for a Gas Explosion.

At the Stourbridge County Court last Thursday, before his Honour Judge Harrington and a Jury, an action was brought by Mr. Thomas Nock, of 19, Mill Street, Kidderminster, fruiterer, against the Kidderminster Gas Company, in respect of an explosion which occurred at his father's shop. Damages had been agreed between the parties; and the action was brought to determine whether the Company were liable on account of negligence. Mr. Waldron appeared for the plaintiff; Mr. Matthews represented the Company. Mr. Waldron said the plaintiff's father took the premises in question, situated in Blackwell Street, Kidderminster, for the purpose of carrying on his business as a fruiterer. They were taken in September, at which time there was no gas connection. On the 27th of September, the plaintiff's mother went to the Gas Company and arranged for the connection to be made. The Company suggested that a shilling slot meter should be put in. On the 28th, the Company sent a slot meter and a workman for the purpose of making the necessary connections. He submitted that the work was done negligently, thereby making the Company liable. Plaintiff was helping his father to prepare the shop for the opening He went to the brewhouse, and on returning took up a lighted candle, and when opposite the door of the living-room an explosion occurred. He was severely burned, and was three weeks in the Kidderminster Infirmary. Mr. Matthews submitted that there was no case to go to the Jury. It was not the duty of the Company to see to the condition of plaintff's fittings. When they had made the connection with the meter, their liability ceased. His Honour said he should direct that there was no case to go to the Jury. The explosion occurred from an escape of gas from the house piping; and the Gas Company had not contracted to see to that. It belonged to plaintiff; and in the absence of any contract between him and the Company to see to the fittings in the house, the latter were not liable.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS CONTROVERSY.

A further stage of considerable importance was reached yesterday in relation to the Nottingham gas controversy, when a somewhat unexpected decision was arrived at, carrying with it consequences of a far-reaching character.

In accordance with the notice given on the previous Monday, a special meeting of the Council was held to consider a proposal by Mr. A. W. Black, M.P., a former Mayor of the city, that, in view of the notification from the President of the Local Government Board that he was not prepared to direct an inquiry into certain matters affecting the gas undertaking of the Corporation, the resolution passed by the Council on Dec. 3 with respect thereto should be rescinded. The resolution referred to was that, in the event of the Board refusing (as they have done) to order a public inquiry, and those who gave evidence before the Special Committee of Investigation refusing to consent to their statements being printed and distributed among members of the Council, the Council themselves should direct a full public inquiry, and that Sir Hugh Owen, or, failing him, Sir Albert Rollit, should be requested to conduct it. The adoption of Mr. Black's resolution would therefore have meant practically a closing of the whole matter; and upon the point whether or not this should be permitted the debate (which was of an exhaustive character) turned.

Mr. BLACK, in moving his resolution, traced the history and financial success of the gas undertaking since its acquisition from the old Gas Company in 1874; showing that under municipal control there had been great expansion of the works and substantial financial results. He said that in the past thirty years considerably over £603,000 had been paid out of the net profits in relief of rates; the average being £21,000 a year. Some four or five years ago, Sir George Livesey was called in to make a report on the undertaking; and Mr. J. H. Brown, the new Engineer, was likewise asked to present a report embodying suggestions. The result was that a certain reduction in candle power and alterations in relation to distributing apparatus were recommended. In time the reduction was made; but now, by common consent, it was admitted that it was made too soon. Sir George Livesey, in a later report, had said that it should not have been entered upon until the distributing arrangements had been so far perfected that a proper pressure could be maintained everywhere. With the reduction in candle power, the difficulties arose; the inefficiency of the distributing plant becoming more marked. It was clear that the difficulties, including the improper mixing of impure gas by one of the subordinates of the Manager, were well known to the Committee. The matter had since been well grappled with by the Committee; the experience of the last six or nine months being conclusive, inasmuch as complaints in regard to the gas had died down, if they had not altogether vanished. The President of the Local Government Board had been asked to hold an inquiry; but, as he had pointed out, he had no statutory power to summon witnesses or require evidence to be given on oath. Any arbitrator who was called in to act for the Council would be in precisely the same position. What sort of an inquiry, under the circumstances, could be held? It could not be as to the management of the gas undertaking, as this would require an expert; and it could not be suggested that either of the gentlemen who it had been proposed should act possessed expert knowledge in regard to the manufacture of gas. What was there, then, to inquire about? There were no charges made against any member of the late Committee; and there was no case for the Corporation to either prosecute or defend. Who was to take up the case, and present it to the Arbitrator or Court? Evidence could not be demanded or required from anybody; and, to his mind, the whole proceeding, from beginning to end, would be ludicrous and absurd. Why should the Corporation be asked to pay so many hundred guineas for an investigation which everybody knew from the outset would be in the nature of a purely farcical proceeding? He should be satisfied if, by his resolution, he saved the Council from making themselves a laughing-stock, and also from prolonging a controversy that could reflect no credit on the Corporation, and do no good under any possible circumstances.

Mr. SPALDING, who seconded the resolution, said he was not desirous in any way that the matter should be hushed up; but he felt it was a painful business, which was injurious to the good work of the Corporation, and more espcially of the new Gas Committee. It was in the best interests of the city to let the matter drop, so that the new Committee should not be hampered in the difficult task before them.

Mr. ELBORNE urged that the ratepayers were entitled to know what the evidence was which was given before the Special Committee of Investigation. It was, in his view, an extraordinary thing that, before the reply was received from the Local Government Board, provision was made, by Alderman Fraser's resolution, for an alternative course of action. If there was anything to induce the Local Government Board to say "No," it was such a proceeding as that. Consent having been given to the evidence being forwarded to the Local Government Board, why should not sanction be also forthcoming to its circulation among members of the Council? It was not so much the question of an inquiry, as of knowing what was said before the Special Committee. If the gentlemen who had given evidence were not willing that their statements should be published, the clear inference was that they did not care to say in public what they had stated in private. He opposed the resolution.

Dr. MILNER said he never entertained the idea that Mr. Burns would direct an inquiry, especially after the rather flippant manner in which he replied in the House to the question of the member for South Nottingham, to whom he suggested that the City Council should, if necessary, seek the aid of the police in the matter. An inquiry seemed to be practically useless; but he (Dr. Milner) thought that copies of the evidence given before the Special Committee should be distributed among the members of the Council. It was all very well to say that the public of Nottingham were sick and tired of the whole business. He did not think it was so. They had simply been awaiting the reply of the Local Government Board. The public feeling would not be set at rest so long as there was any idea that something was being kept back.

Mr. SANDS, a former member of the Gas Committee, who was one of the witnesses at the private inquiry, said that Mr. Elborne, as a lawyer, might have been expected to know there were good reasons for the refusal to give consent to the publication of the evidence. The statements which had been made by himself and other members of the late Committee were such as they were prepared to adhere to; and if the proper time came, they would repeat them. What they would not consent to in the matter was the exoneration of other persons in regard to the publication of their own statements. If they consented to the publication of the latter's evidence, they would be taking away from themselves the right to vindicate themselves from slanderous statements made by other people. The only reason, therefore, they refused the publication, was that they were not prepared to exonerate others from the consequences of their allegations.

Dr. DABELL said that during the recent municipal elections he pledged himself to support an inquiry into the matter, if the public desired it. Since then he had observed increasing evidence of the wish on the part of ratepayers that there should be further information forthcoming; and therefore he could not support Mr. Black's resolution. Since it had been stated that the evidence would not be made public, inference had become clear that something was said before the Special Committee which it was wished should not be published. The ratepayers, however, wanted to know what it was, and would not be satisfied without an inquiry of some kind.

Mr. SWAIN, a newly-elected member of the Council, also expressed his inability to support Mr. Black's proposal; stating that, during his recent municipal electoral campaign, he was again and again asked whether he would vote for an inquiry into the gas question. He replied in the affirmative in every case. He appealed to the majority in the Council to settle the matter once and for all to the satisfaction of the ratepayers. Personally he should have sufficient confidence in a Select Committee appointed by the Council to undertake the inquiry, whatever the political opinion of members of the Committee might be. The mistake which had been made from the beginning was to take the evidence in secret. He thought the main points were: Why did certain members of the Gas Committee resign; and why were charges which the Committee found were not proved against the Gas Engineer ever made?

Mr. PENDLETON said the Special Committee was appointed to inquire into the reason for supplying bad gas. He thought the Council would like to know whether they dealt with this important matter; and he appealed to Sir John M'Craith for an answer.

Sir J. T. M'CRAITH said the Committee did not go thoroughly into the question of bad gas, but they dealt with many matters which more or less led up to it. They came to the conclusion that they had not the power or the time to thoroughly overhaul the gas undertaking, as represented by the works and plant; and after thoroughly discussing the question, they arrived at the opinion that the better course would be for the new Committee to go into these matters and report forthwith to the Council. He could not vote for the resolution proposed that day. He quite appreciated the desire for fuller information. The Special Committee were forced to hold their meetings in secret, if evidence was to be taken. It seemed to him that every desire would be met if the alternative scheme of Alderman Fraser was accepted, asking consent to the publication of the evidence. He had always advocated that copies of the evidence should be supplied to members of the Council. From what Mr. Sands had said, his consent and that of some others who gave evidence could not be obtained. Therefore he (Sir John) urged that the Special Investigation Committee, or some other Committee, should hold an inquiry in public; and then all that was desired by the ratepayers would be attained.

Alderman FRASER said the point which had been made in the course of the discussion, that the evidence given before the Special Committee should be made public, was one which it was known could not be conceded. The evidence was taken in confidence; and upon this point the representatives of both the political parties on the Committee were pledged. He had no objection himself to the matter being inquired into by a fresh Committee, or to the evidence being taken in any way. Let it be done openly in the Council Chamber, or in any other manner they pleased. He was more determined than ever now, after hearing the speeches which had been made, that the whole of the matter should be, by some means or another, investigated.

Mr. PENDLETON moved—"That this Council is of opinion that a Select Committee of five members should be appointed to inquire into the supply and cause of the supply of bad gas." He thought ratepayers were entitled to know something about the amount of money invested in the water-gas plant at the Basford works, and not only invested, but sunk there. They wanted to know whether it was the Chairman of the Committee or the Engineer who advised the expenditure on that plant.

The MAYOR suggested that the terms of reference to the proposed new Committee should be that they should hold a public inquiry into the working of the gas undertaking during the last five years. He felt sure it was desirable that the inquiry should be kept within their own number, without calling in outside aid—care being taken that there should be no mystery, but the fullest possible publicity, in regard to the matter.

Sir J. T. M'CRAITH seconded Mr. Pendleton's amendment.

Alderman FRASER asked that, in the event of the amendment being accepted, the selection of the Committee should be deferred until the next meeting.

Sir JOHN M'CRAITH expressed agreement with this suggestion.

Ultimately the amendment, in altered terms suggested by the Mayor and accepted by Mr. Pendleton, was carried in the following form, with four dissentients only:—

> "That the resolution passed by the Council on Dec. 3 last, with reference to investigation into the gas undertaking, be rescinded, and that a Special Committee of five members be appointed to hold a public inquiry into the working of the gas undertaking during the past five years."

EXPLOSION AT THE DUBLIN GAS-WORKS.

Last Thursday morning, while the workmen were engaged on the revivifying floor situated under the purifiers at the works of the Alliance and Dublin Consumers' Gas Company, in Great Brunswick Street, some gas which (from an at present unknown cause) had collected beneath the purifiers, ignited, and the flame striking downwards came in contact with the workmen engaged on the floor, with the result that seventeen of them were more or less seriously injured. The ignition of the gas is attributable—so far as can be ascertained—to the fusion of an electric cable; electric lighting being solely adopted for lighting throughout the purifying department. Little damage has, however, been done to the plant; and the gas supply was not materially interfered with. After attention at the hospital, several of them were able to return to their homes; and others progressed favourably. One, however, it is reported, has since died.

Since the occurrence, Mr. W. F. Cotton, jun., the Engineer and Manager, has received numerous letters and telegrams of sympathy for the injured, and offers of help for himself and staff from many gas engineers and others throughout the United Kingdom. To all these friends Mr. Cotton desires us to convey the thanks of the Company and the suffering workmen.

EAST HULL GAS-WORKS PURCHASE BILL.

Ratepayers' Meeting.

Great interest has been taken locally in the proposal of the Hull Town Council to purchase the undertaking of the East Hull (or Sutton, Southcoates, and Drypool) Gas Company; and there was a crowded attendance last Thursday at the meeting of ratepayers which was called to express approval or disapproval of the Bill which will enable the scheme to be carried out.

The resolution in favour of the promotion of the Bill, so far as it refers to the acquisition of the gas-works, was moved by Alderman Larard, J.P., who said he had so strong a conviction that this step was taken in the best interests of the ratepayers, that the duty of commending it was a pleasure. It was opposed by those who viewed with alarm any municipal enterprise and dubbed it "municipal trading," and, naturally, it was opposed by interested parties. When the East Hull Gas Company went to Parliament last session for a Bill to extend their capital, the Corporation secured a clause; and they were now seeking to give effect to it. They had to promote a Bill this session or lose the opportunity for years; and if in years to come the ratepayers wanted to acquire the undertaking, they would have to buy it at a very much larger price, and under more difficult circumstances. It was significant that each time the Corporation had opposed the Company in Parliament, a reduction in the price of gas had been made; but if this Bill were rejected, there was nothing to prevent the Company putting on the 6d. they had just taken off. The Corporation wanted, before all, full possession of their streets; secondly, they argued that the policy of the Company had not been in the public interest; and, thirdly, they believed that, under careful management, they could make the undertaking a commercial success. As to the price, the divisible profit of the Company last year was £7500. The Corporation paid for the old Kingston works 18·89 years' purchase of the divisible profits; but suppose they had to buy the East Hull undertaking on a basis of 20 years' purchase, they would have to give £150,000 for the £100,000 actually invested. This would be a good return to the shareholders; and he was not frightened about making it a success on these terms.

The motion having been seconded, some discussion took place. Mr. Lambert, in moving a direct negative, remarked that no information had been given to show that the undertaking was not likely to cause serious loss to the ratepayers. The Company, he said, could not pay more than 5 per cent. on their new capital; and the price of gas must be automatically lowered when their reserve fund reached £10,000. There was no certainty that the Bill would be obtained; and if it were, they might have to pay 27 or 30 years' purchase, as well as compensate permanent officials and Directors. Opposition was also offered by Alderman Robson, a Director of the Company, who created some excitement by declaring that if the purchase were made on the terms of the Kingston Company, it would cost the Corporation over £1,000,000. He was a Director of the Kingston Gas Company, and for every £22 10s. paid-up, he got £150. He said that the Corporation would have to pay so much for borrowed money that the price of gas would have to be raised.

Alderman Rollit remarked that he approved of the purchase, because if the undertaking was not a good thing, the Company would not want to stick to it; and Alderman Larard, replying to the discussion, said the only compensation the Directors would get would have to come out of the price which was paid to the Company.

The resolution was then put. The voting was nearly equal; but the declaration of the Mayor (Alderman H. Feldman, J.P.) that the resolution was carried was not challenged. In response to a question from a member of the audience, Mr. Lambert was understood to say that a poll would be demanded.

Articles both for and against the scheme have appeared in the local Press, the "Yorkshire Post" having published one, in the course of which the following statement is made.

In respect of its gas supply, Hull occupies a peculiar, if not a unique, position. Until recently, the town was in the hands of three Companies—the eastern portion being supplied by the Sutton, Southcoates, and Drypool [now the East Hull] Company; the area within the docks by the now defunct Kingston-upon Hull Gas Company; and the rest of the city by the British Gaslight Company, whose works are at Sculcoates. A few years ago the Corporation purchased the undertaking of the Kingston-upon-Hull Gas Company, and instead of carrying on the manufacture of gas, the City Fathers placed themselves in the position of the "middleman" of commerce. They made an arrangement with the British Gaslight Company to take gas from them in bulk at a fixed price of 1s. 6d. per 1000 cubic feet; and they sell it to the consumers at 2s. 6d. The balance of 1s. per 1000 feet is used to defray the cost of public lighting in that part of the old town, the cost of distribution, and the payment of interest and sinking fund to eventually extinguish the debt. It is interesting to note that the old works were acquired for £94,000, which was equal to about 19 years' purchase, and that in eight years the Corporation have been able to pay off £23,540 in interest and sinking fund charges; the consumers have saved £11,476 in reduced charges for gas; and there is a balance in hand of £1944. In addition, by the removal of the old works they obtained a splendid site, which is now being utilized for the erection of new Law Courts and the extension of the Town Hall. This bargain seems to serve a useful purpose in the present campaign.

MANCHESTER GAS-WORKS EXTENSIONS.

£300,000 to be Borrowed.

At the Meeting of the Manchester City Council last Wednesday, Alderman Gibson, the Chairman of the Gas Committee, moved a resolution authorizing the Committee to apply for leave to borrow £300,000 for the purposes of the gas undertaking. He said that the Committee wanted £100,000 for a new 10 million cubic feet gasholder, £44,000 for the completion of No. 2 retort-house at Gaythorn, £54,000 for mains and service-pipes, £42,000 for meters, and £60,000 for cooking-stoves. He pointed out that the construction of a large holder was cheaper in proportion than a small one. Moreover, he held it to be good policy to have storage capacity equivalent to one day's producing power, which the Committee had not now. They must provide for the future. In 1895, the number of gas consumers was 82,289; whereas in 1906 it was 160,113. The average increase per annum the last twelve years had been 3½ per cent.; but the increase last year was 6 per cent. The number of stoves in 1895 was 3379; and last year it was 29,760—an increase of 26,641.

The motion having been seconded, Mr. Bowie asked what was the gross debt of the Gas Department; and Mr. Sutton inquired whether it was debt or capital. To these queries, Mr. Hart added the suggestion that Alderman Gibson should state what the assets of the undertaking were.

In reply, Alderman Gibson said that ten years ago the reserve fund stood at £39,499; and to-day it was £147,607. In ten years they had paid off by the action of the sinking fund £344,977. During the same period, they had charged against revenue for renewal of plant £315,413, and paid out of profits for the relief of the rates £517,855. They had also in ten years paid out of surplus profits for extensions of works, where borrowing powers had not been granted, and for the extinction of consolidated 4 per cent. stock, £100,746, and added £887,037 to the capital. In short, the assets had increased in ten years by 49 per cent., and the liabilities by 40 per cent. During the same period, the number of consumers had increased from 82,289 to 152,165, of whom 47,865 used prepayment meters. The mortgage debt on the undertaking in 1895 was £828,627, or £10 1s. 4d. per consumer; and in 1905 it was £1,245,815, or £8 3s. 8d. per consumer.

This explanation was received with applause; and the resolution was then carried unanimously.

BIRKDALE AND THE TESTING OF SOUTHPORT GAS.

A Board of Trade Arbitration.

Once more the Southport Corporation and the Birkdale Urban District Council are at variance over a matter appertaining to the gas supply by the Corporation to the Council's district. The point in dispute is as to the burner to be used for testing; and it has involved a Board of Trade arbitration.

Under the Act by which Southport supplies Birkdale with gas, it is provided that tests shall be carried out with the "London" argand No. 1 burner, or such other burner as may be approved by the Board of Trade, on the application of either party; and Southport is now wishful to change over to the "Metropolitan" No. 2 burner, the use of which it is argued has been sanctioned by the Board of Trade in the Metropolis and many other places. Birkdale have, however, found themselves unable to agree to this alteration; their contention being that the "Metropolitan" No. 2 burner, with the same gas, would show from 2 to 3 candle power more than the "London" No. 1. It was under these circumstances that, a few days before Christmas, the parties waited upon the Hon. T. H. W. Pelham, and two other members of the Board of Trade, in London, to ask them to settle the dispute. Both sides were heard; and the Board's decision is expected to be made known shortly. It may be mentioned that at the inquiry the Southport Corporation were represented by Sir George Livesey, Alderman Travis (the Chairman of the Gas Committee), Mr. J. E. Jarratt (the Town Clerk), and Mr. J. Bond (the Gas Engineer). Those attending on behalf of the Birkdale Council were Mr. Pye and Mr. Hayes (Chairman and ex-Chairman respectively of the Lighting Committee), Mr. Isaac Carr, and Mr. J. G. Newbigging.

As mentioned above, Birkdale argue that the use of the "Metropolitan" No. 2 burner would result in the same gas showing from 2 to 3 candle power higher than when tested by the "London" No. 1 burner; and they further contend that the burner is structurally inefficient, inasmuch as air can be admitted to it, and the light regulated, at the will of the tester. Consequently they say that, for the same quality of gas as is now used, the consumers will have to pay from 2d. to 3d. more per 1000 cubic feet. In fact, Birkdale's case is clearly set forth in a letter addressed by the Clerk of the Council to the Board of Trade, in which the writer says:—

> "I am directed to call your attention to the fact that . . . the Town Clerk of Southport admits a loss to the consumer both

with respect to the illuminating power and calorific value. In considering the application of the Corporation, my Council desire to point out that, although Birkdale is within the limits of the Southport gas area, the Corporation are required, by section 43 of the Southport Improvement Act, 1871, to pay to the Birkdale Council the sum of 3½d. per 1000 cubic feet for the right to supply private consumers in Birkdale with gas, and an additional payment of 4½d. per 1000 cubic feet for the use of the gas-mains in Birkdale, which are owned and kept in repair by the Birkdale Council. The benefit which will accrue to the Corporation, the Town Clerk has admitted, cannot, under existing circumstances, be shared in any way by Birkdale; but, on the contrary, it will inflict a loss on the Birkdale gas consumers, and at the same time go to increase the enormous profits of the Corporation from their gas undertaking. My Council strongly object to the adoption of the No. 2 "Metropolitan" argand burner, for the reasons herein mentioned; and they have every confidence in leaving themselves in the hands of your honourable Board for protection."

Briefly, the attitude of Southport is that, as the "Metropolitan" No. 2 burner has received parliamentary sanction, nothing can be said against its being a better burner for testing with than the "London" No. 1. The Southport supply is made up of about two-thirds coal gas and one-third carburetted water gas; and it is maintained that, as with the latter the quantity of air required to produce a good flame for testing purposes is less than would be needed if the gas were all of it coal gas, the Corporation are entitled to vary the air supply. It is denied that the use of the proposed burner will result in any such saving in the cost of gas as is anticipated by Birkdale; but, at the same time, if any saving should be realized, it is the intention of Southport to give the consumer the benefit of it. Alderman Travis himself calculates that there will be a saving of about ⅝d. per 1000 cubic feet in the cost of manufacture; and his view is that the difference in the calorific value of the gas would be so slight with incandescent lighting that the consumer would never know it, while if he obtained his gas cheaper as a consequence he would feel the benefit.

GAS MATTERS IN BELFAST.

Depreciation and Reserve.

At the Meeting of the Belfast Gas Committee last Friday week, the Manager (Mr. James Stelfox) stated that on Christmas Eve, which was a very dark and wet day, the output from the gas-works totalled 10,806,021 cubic feet, which established a record; the previous record being that of Sept. 21, 1905, when the output was 9,904,080 cubic feet. The Clerk (Mr. Getty) read a memorial from 42 inhabitants of the Cregagh district, stating that they were prepared to take gas into their houses at a rate of 3s. per 1000 cubic feet. Mr. Stelfox explained that this extension would necessitate the laying of about 1800 yards of main. It was decided that the work should be proceeded with, and gas supplied to the memorialists on the terms stated.

There was a lengthy discussion of a recommendation made by the Accountant (Mr. D. Creighton) in regard to the establishment of a reserve fund. Mr. Creighton explained that in the Local Government Board Auditor's report, dated the 1st ult., the following words occurred: "Up to the present, no allowance has been made for depreciation in connection with the general capital expenditure, which has now reached a total of nearly £900,000; and there is no reserve fund in existence to provide for any special expenditure—such as, for example, the cost of the renewal of a gasholder or retort-house—which may become necessary before very long, and must be met out of the revenue of the undertaking." Mr. Creighton said he agreed with the Auditor that something should be done in the direction indicated by him; and he would suggest that the large balance of £61,338 standing at the credit of net revenue account be dealt with as follows: Write off general expenditure item a depreciation of 2½ per cent., equivalent to £22,188; write off automatic meters item a depreciation of 10 per cent., equal to £2988; and carry to reserve fund £30,000. This would leave a balance of £6162. The contribution to depreciation would bring up the amount to £87,353, or an average of 8 per cent., on the total capital expenditure. The reserve fund could be used for any contingency that might arise. Besides, he said, as the Committee were aware, the Local Government Board had recently issued an order prohibiting local authorities from overdrawing their banking accounts; so that it would be important to have such a fund, which he presumed could be used for working capital if necessary. A resolution recommending the Council to carry out Mr. Creighton's suggestion was unanimously agreed to.

New Lighting Contract for Colombo.

We learn from the Secretary and General Manager of the Colombo Gas and Water Company, Limited (Mr. S. Wellington, F.C.S.), that the Company have lately concluded with the Municipality a new contract for lighting the city. The principal features of interest are that the gas is to be of 10-candle power only, and of a thermal value of 400 B.Th.U. The illuminating power of the street-lamps is guaranteed at 60 candles; and they number at present some 2350. The Company have been successful in obtaining the withdrawal of the sulphur clauses, whereby they were penalized for anything above 20 grains of sulphur per 100 cubic feet. The Council have also agreed to purchase the remaining street-lamps (1215) at present the property of the Company. The new contract came into force on the 1st inst., and it will terminate on Dec. 31, 1916. The price of gas for power purposes is Rs. 3·50 per 1000 cubic feet, which will compare very favourably with other Oriental Gas Companies. Colombo now shares with Berlin the distinction of having reduced the illuminating power of its gas by 5 candles, and brought it down to as low as 10 candles. We learn also that the new Graving Dock at Colombo is being fitted with incandescent gas, and also the new Central Railway Station of the Ceylon Government Railways.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1906;" and, as on previous occasions, we extract from it the portions with which our readers are most closely concerned.

Following their usual practice, Messrs. Bradbury and Hirsch offer a few observations upon trade and manufacture in general, and upon the fertilizer trade, before proceeding to review the markets for sulphate of ammonia and nitrate of soda. A year ago, they were able to record a decided improvement in most branches of industry and commerce, with every prospect of further development. The most sanguine, however, hardly expected such a record as the past year discloses, not only in the United Kingdom but the world over—any exceptions being due to special causes. In the United Kingdom, the coal, iron and steel, and all dependent industries, were exceptionally busy with home and export orders. The United States and Germany—now the largest iron and steel countries—have not been able to supply all their requirements, but instead of "dumping" surpluses upon our market, as was the case not long ago, they have been obliged to turn to this country for supplies. The fertilizer trade has also had its innings, and has had an extremely busy time both on the Continent and in the United Kingdom. So much has this been the case, that for months past very few of the export manufacturers have been able to book further important export orders for near delivery; while some of them have been hard put to it to fulfil existing contracts. All these things testify to a very rapid increase in the world's requirements in every department of life, and promise well for the current year. The only regret is that sulphate of ammonia manufacturers should not have been able in 1906 to share in the general prosperity, owing to circumstances which will be discussed at a later stage in the report.

Although the sulphate of ammonia trade is the *raison d'être* of their review, Messrs. Bradbury and Hirsch deal first with the nitrate of soda situation, because of its important bearing upon the market for their staple article. They quite admit that the nitrate of soda factor is not the only one to be considered; and they say it has probably been of less importance than the largely increased output of sulphate of ammonia during the past twelve months. But without a fairly clear view of the nitrate situation, it would be useless for them to attempt any forecast of the sulphate market, which, of course, is what their friends are chiefly interested in. They therefore first address themselves to a short review of the nitrate market.

At the end of 1905, they calculated that the supply of nitrate for the ensuing four months would be somewhere about 778,000 tons; and the actual supply proved to be 769,300 tons, or 8700 tons less than their estimate. The deliveries from ports were 722,770 tons; and the stocks carried forward into May, 46,530 tons. They say this shortage is not easy to account for; the highly remunerative level of prices current, and the uncertainty as to the terms upon which the Combination could be renewed, if it could be renewed, affording every reason for pushing supplies forward as rapidly as possible. When it became known in May that the Combination, which had been renewed for three years at the end of March, had fixed the maximum quantity permitted to be shipped between April, 1906, and March, 1907, at 43½ million quintals—85 per cent. up to the end of December—there was something like a panic on the Continental market, and a heavy fall in prices. Other circumstances perhaps contributed; but the action of the Combination was the main cause of the consternation. Forthwith sellers began to realize, at any prices obtainable, not only stocks, but anything near at hand, though, singular to relate, the forward position was not very much affected. But a saner view of the situation supervened. Reflection brought into prominence the fact that the quantity agreed upon by the Combination was only the maximum permitted to be shipped, and that in no recent year had shipments reached the maximum within several million quintals, notwithstanding the inducement of high prices. Moreover, it was observed that while Europe was more or less hysterical, producers, who could best judge of the probable effect of the Combination's decision upon production, were not at all upset; and first suspicion, then conviction, began to spread that, after all, it was true that production was limited by labour supply, and that capacity to produce did not greatly exceed the previous year's output. Within three months the April level of prices was restored. Panic being replaced by confidence, and stocks in Europe being moderate, steady buying was resumed in June, and was well sustained right up to November; the visible supply at the end of October being actually 34,000 tons less than that at the end of October, 1905. In November, advices of heavy shipments being made began to disturb the minds of holders. The conversion of a shrinkage in visible supply at the end of October of 34,000 tons to an increase of 45,000 tons at the end of November, coupled with the anticipation of a further increase by the end of December, very materially altered the situation and opinion; and whereas previously buyers had been rather inclined to anticipate their requirements, since early in November they have stood steadfastly aloof.

Messrs. Bradbury and Hirsch do not think it can be said that at any time since January last has the nitrate market been overburdened with stocks. On the contrary, they have been kept within very moderate compass; so that, with the exception of a short time in May and June, spot prices have been maintained at a high level in relation to the forward position. In January, the price was 10s. 9d. per cwt., in February 11s., in March 11s. 3d., and in April 11s. 6d. In May, there was a drop to 11s.; but the lost ground had been recovered by September. In October, 11s. 10½d. per cwt. was reached—the highest price for the year. There was a decline to 11s. 3d. in November; and this was the closing quotation in December. Refined quality ranged from 3d. to 6d. per cwt. above the price of 95 per cent.; and, owing to scarcity, the difference in price was at times as much as 9d. per cwt. The authors do not think it necessary to follow the course of cargo business, which was exceptionally heavy; but in order to show the trend of the forward market, they give the prices delivered free

on board on the west coast. These steadily advanced from 7s. 3d. per quintal in January to 8s. 1½d. in April. There was a slight set-back in May, but it was short-lived; and in June 8s. 3d. per quintal became the price. From that time forward there was a rapid advance to 9s. 4d. per quintal in August. Later, up to 9s. 6d. was quoted; but as in the closing months of the year makers had practically nothing to sell for near delivery, quotations, which fell to about 8s. 6d. per quintal in December, were mainly nominal. Thus the nitrate of soda producing interest had a glorious time; and, while dividends were very substantially advanced, large sums were expended on new ground and plant or written off for depreciation. Messrs. Bradbury and Hirsch consider that the companies, without exception, stand to-day in a better and sounder position than at any period in their career, quite apart from the prospects of the current year. The visible supply (stock and afloat) for the United Kingdom and Continent at the end of 1906 was about 734,000 tons, compared with about 678,000 tons in 1905 and about 672,000 tons in 1904. The present visible supply is thus 56,000 tons more than that at the end of 1905, and 62,000 tons more than that at the end of 1904; but the quantity now loading is only about the same as at the end of the first-named year.

Coming to sulphate of ammonia, Messrs. Bradbury and Hirsch say that when discussing the situation a year ago they expressed grave doubts about the stability of the market over the spring months. The dominant factor seemed to be the rapidly increasing production in Germany; but the fortuitous circumstance of the colliery strike there in January and February, 1905, with its consequences, was, in their opinion, of scarcely less importance in its bearing upon the market in January to April—the period they had specially in view. The strike occasioned an extra Continental demand for British sulphate of probably 6000 to 8000 tons; and consequently it was necessary to count upon an equivalent falling off in demand during the spring of last year, seeing that there did not appear to be any prospect of another strike. They had also to take account of increasing production in the United Kingdom, from fresh carbonizing plant then coming into operation, as well as what might be expected from gas works and other sources. They had further to consider what larger outlets could be found for the extra supply thus occasioned; and they were scarcely able to find them. They assumed that the Continent would absorb increased German production. They looked for "much larger requirements for Spain;" they were of opinion that "contracts already existing assured increased shipments for Japan;" and they thought that sugar-growing Colonies "would take larger supplies." They also suggested that relative cheapness would probably induce some further reversion to the use of sulphate in the United Kingdom. Having considered all these points, they could not see sufficient to justify any such recovery in prices as was experienced in the early part of 1905, though relative cheapness might perhaps occasion a larger Continental demand than was anticipated. They did, however, look for a substantial recovery from the depression which had settled upon the market in the preceding month—December. Exports last year followed rather closely the lines they indicated as probable, as shown by their tables of shipments, from which we take the following figures: To France, Germany, and Belgium, 33,922 tons; to Spain, Italy, and the Canaries, 62,561 tons; to Holland, Java, British Guiana, the West Indies, and the Mauritius, 45,274 tons; to the United States, 13,345 tons; and to other countries, 46,354 tons (Japan taking 33,237 tons, against 33,861 tons in 1905, 14,981 tons in 1904, and 3612 tons in 1903)—making a total of 201,456 tons, against 189,349 tons in 1905, 177,287 tons in 1904, 162,217 tons in 1903, and 162,754 tons in 1902. Messrs. Bradbury and Hirsch say that, in view of all the export figures, it must be admitted that the market took the course that was inevitable, and this without in the least admitting that relative cheapness had nothing to do with demand. It was, in fact, causing the absorption of rapidly increasing Continental production, and an increase in home consumption, without which prices must inevitably have sunk to the level of actual nitrate of soda prices, or even lower.

After a few comments on the figures presented in the tables, Messrs. Bradbury and Hirsch say that if they follow the course of market prices they will find less to guide them in export figures than in other circumstances; for while there was practically no increase in exports from July up to November, when the market went to pieces, there was a very substantial advance in prices, culminating at the end of October. This was due primarily to the increasingly strong position of nitrate of soda. Operators argued that the sulphate market was bound to be affected advantageously; and in July they began to buy in the forward position—August-December at up to £12 2s. 6d. per ton, October-March at up to £12 5s. per ton, and January-June at up to £12 7s. 6d. per ton. In August the advanced ideas of makers choked buyers off, and they turned their attention to the spot market. In September further business was done in the forward position at about previous prices; but the spot market was not much affected thereby. In October, however, again owing mainly to nitrate of soda influences, there was keen buying for delivery ahead, at up to £12 7s. 6d. per ton for November-December, at £12 12s. 6d. per ton for delivery over the spring months, and at up to £12 10s. per ton for April-September f.o.b. Leith. Concurrently the spot market became very active, and there was large buying at up to £12 3s. 9d. per ton f.o.b. Hull. At other ports, more particularly in Scotland, much higher prices were paid; there being large actual requirements for late October and early November delivery. November witnessed a complete breakdown. When unprecedentedly large shipments of nitrate for November were seen to be assured, the nerves of the sulphate trade—buyers and sellers—received a shock; and on the part of buyers an attitude of indifference was immediately substituted for that of urgency. The forward position was left severely alone, while the spot market dropped to £12 per ton; the heavy shipments in November being mainly contracted for in October or earlier. In December the spot market gradually, but steadily, declined until £11 12s. 6d. was touched—the price current early in July. There was practically no first hand forward business done in this month, the large makes being already rather fully sold up to June; but there was speculative selling for delivery over the near months at a moderate premium on spot prices. The average price for the year, delivered f.o.b. Hull, is £12 0s. 9d. per ton; and in relation to the average price of nitrate, 95 per cent., at Liverpool, £11 6s. 7d. per ton, Messrs. Bradbury and Hirsch think it must be admitted that the result is disappointing. But when all the circumstances of the case are considered, they do not regard the price as being much below what the actual situation has justified. They do not see that the market has at any time suffered much from the operations of speculators. On the contrary, they think speculators have suffered more at the hands of the market. Certainly from July to November the ever-present consciousness of dear nitrate of soda limited the action of would-be "bears;" while it enabled makers to effect sales at prices which may possibly not again be reached during the running of the contracts.

Passing on to consider why the price of sulphate of ammonia has not attained and maintained an altogether higher level, having regard to the high prices for all other nitrogenous material, particularly nitrate of soda, Messrs. Bradbury and Hirsch say that, in the first place, and mainly, it is because of the very large increase in the European production. The increase in Germany alone is estimated at 25,000 to 30,000 tons, and that in the United Kingdom at 15,000 tons; while France accounts for a further 2000 tons. It is impossible to get at even approximate figures for other European countries; but by putting the increase at 8000 tons, they do not think they are going beyond the mark. Thus they have an aggregate increase of something like 50,000 tons; and they confine their remarks to these figures, since it is impossible to even guess at production outside Europe, and in any case it does not appreciably affect the European market. After a period of stagnation extending over 1903 and 1904, during which there was no increase in the output of sulphate of ammonia from gas-works, the days of expansion were resumed in 1905, and were continued through 1906. In the former period, electric lighting and the use of incandescent in place of ordinary gas-burners was very largely extended; neutralizing the natural increase in the consumption of gas on new property. Water gas was, moreover, being largely introduced. In the later period, there was not so much a substitution of one light for another, but rather the introduction of the better illuminants on new property. But inasmuch as these better illuminants do not find their way into comparatively small property or into all new mills and works, there has been something like the natural increase in the consumption of gas that was customary in former years, accentuated by exceptional activity in all industrial centres. The authors estimate the augmentation in the production of sulphate from this source at 6000 tons. There has again been an increase from carbonizing, more particularly in the Tyne district, estimated at 6000 tons. Further installations and extensions of the Mond gas process account for 3000 tons more; but from shale the output has probably not increased appreciably. Messrs. Bradbury and Hirsch estimate the production of ammonia, calculated into sulphate (including that used in the manufacture of ammonia soda and other chemical processes), from all sources in the United Kingdom, during the past year, at 283,500 tons.

	Tons.
Gas-works	162,000
Iron ,,	20,000
Shale ,,	46,000
Coke and carbonizing works and producer gas	55,500
	283,500

Of this production, they reckon that England contributed 186,000 tons; Scotland, 95,000 tons; and Ireland, 2500 tons. The output (in tons) during the previous five years was as follows:—

	1905.	1904.	1903.	1902.	1901.
Gas-works	156,000	150,000	150,000	150,000	143,000
Iron ,,	20,000	19,500	19,000	18,500	16,500
Shale ,,	46,000	42,500	37,500	37,000	40,000
Coke and carbonizing works and producer gas	46,500	33,500	27,500	23,500	18,000
Totals	268,500	245,500	234,000	229,000	217,500

The authors' estimate of production from all sources during 1905 proved to be decidedly below the mark; and their estimates of home consumption and of makers' stocks were similarly short. Assuming 15,000 tons for the stocks, including goods not delivered, the account for 1906 will stand as follows:—

	Tons.
Stock brought forward from 1905	15,000
Production in 1906	283,500
	298,500
Exports during 1906	201,500
Home consumption (for all purposes) in 1906	82,000
Stock to carry forward into 1907	15,000
	298,500

Messrs. Bradbury and Hirsch consider that, having regard to the industrial activity in the country, a further increase in production of sulphate of ammonia from gas-works must be expected; and the same may be looked for from carbonizing works. They do not think producer gas promises much expansion; and, so far as can be ascertained, the Scotch oil companies do not anticipate much increase in output. Therefore, although a substantial rise in the current year's production must be counted upon, it is not thought to be likely to exceed 5000 or 6000 tons within the next four months. Although advices from Germany do not point to any very large extensions of carbonizing plant in Westphalia, it is certain that the existing plant must be kept going at the highest pitch through the year in order to cope with the demand for coke; and there must be some extension, though it may not come into operation immediately. An increased make of sulphate compared with the output over the spring months of 1906 must therefore be looked for. If substantially increased production must be looked for in the United Kingdom and in Germany, if some increase elsewhere in Europe is assured, and if the United States should again be practically self-supporting over the first half of the year, to what countries are we to look for demand sufficient to absorb increased

production? The authors do not think it is too much to hope that the Continent will do more than absorb the increased German production, notwithstanding the set-back in nitrate of soda prices, because sulphate of ammonia is still relatively so much the cheaper article that the consumer who would have used sulphate had nitrate remained at the higher level will still use it. They are of opinion that reversion to the use of sulphate will go on, while increased production will be less than it was over the same period in 1906.

In the meantime, the German market is in the hands of German producers, and may be expected to remain there until a fair proportion of the make is sold. French requirements are certain to be larger than they were over the last spring season; French agriculturists being determined to substitute sulphate of ammonia for nitrate of soda as far as possible, and there not being much elasticity about home production. Spanish requirements over the early months of 1906 were exceptionally heavy; and it is doubtful whether they will be exceeded in 1907. However, it is not thought that there will be any falling off. Japan brought forward very considerable stocks from 1905 into 1906, and had, moreover, made large contracts for shipment in January to April; but buyers have adopted a different policy with regard to 1907. For some time they have been very cautious in their operations, and they are approaching the coming season with smaller stocks and with fewer contracts on their books. This policy may have been induced by larger supplies of other fertilizers; but it is also likely to have been dictated by the hope for lower prices. There have, in fact, been large inquiries on the market from Japan from time to time; and the question of price alone has prevented a much greater business. The authors think it would be unwise to dogmatize about the requirements of a country which has so recently emerged from abnormal conditions. All they venture to say, therefore, is that the 1906 level of requirements may very likely be maintained; and they do this on the strength of the extraordinary enterprise of the Japanese. The Colonies alone remain to be considered; and with reference to these Messrs. Bradbury and Hirsch point out that shipments during the past six months have dropped about 4598 tons. They do not, however, regard this fact as an indication that requirements are falling off. Rather, they think, it justifies the expectation that larger shipments will be required in the early months of the current year. It only remains to add that they look for increased demand in the home trade.

Apart from considerations which may in the main be special to the sulphate of ammonia trade, there is a general consideration to which the authors deem it necessary to call attention—the enormous extension in the use of fertilizers all the world over. So far this has been seen most in the superphosphate trade, and it has brought about a rapid advance in the price of the raw material. But superphosphate is not alone to be affected. In their opinion, its complementary constituents, nitrogen in particular, must proceed with it, not necessarily step by step, but very much that way; and whether it is taken in the shape of mixed manure or as raw material, the result must be the same—a larger general demand for nitrogenous material, of which sulphate of ammonia is by far the cheapest. Demand has been showing itself from many out-of-the-way places the trade never thought of a few years ago; and the authors think that in the aggregate this must be counted upon in the future. While, therefore, not taking a very sanguine view of the near future, they expect the market to right itself as the spring months are approached. For two months the market has been neglected by purchasers, who, as far as possible, have put off their buying. This policy must involve much larger buying later on, apart altogether from the question of the relative cheapness of sulphate of ammonia; and the expectation of a recovery to the level of October prices does not appear to them to be unreasonable.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 6, sulphate was 12s. 4½d. per cwt. and nitrate 10s. 9d.; on April 7, the prices were 12s. 3d. and 11s. 4½d.; at Midsummer, they were 11s. 9d. and 11s.; at Michaelmas they were each 11s. 10½d.; while at the close of the year they were 11s. 7½d. and 11s. 3d. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1897, 7s. 9½d.; 1898, 7s. 6¾d.; 1899, 7s. 11¾d.; 1900, 8s. 5½d.; 1901, 8s. 11½d.; 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; and 1906, 11s. 4d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 40 years—1867 to 1906. The following are the averages for the past ten years: 1897, £7 18s. 5d.; 1898, £9 9s. 7d.; 1899, £11 5s. 10d.; 1900, £11 2s.; 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.

Water Purchase Question at Beverley.—The Beverley Town Council have received a letter from the Local Government Board sanctioning the purchase of the local water-works undertaking for £21,350, but disapproving of the site of a proposed new bore, on the score of danger of contamination from sewage. They recommend that the bore should be taken further away; and they state that, if it proves satisfactory, the question of serving a larger area than the borough will be considered by the Board.

Trouble at the Wombwell Gas-Works.—A newspaper report states that a sensation has been caused in Wombwell on account of the gas-stokers employed by the Urban District Council having received fourr teen days' notice. It has been discovered (so it is said) that one os more of their number have been guilty of tampering with the process of gas production; and the officials having been unable to find out the culprit or culprits, have had no alternative but to give notice to the whole set. It is alleged that recently they have reduced the production by at least 50,000 cubic feet per day. The matter has been reported to the Council; and last Friday an inquiry was held at the Town Hall, at which one of the stokers was called upon to give evidence. A great many complaints have of late been made respecting the low pressure of gas and insufficient supply.

ENGLISH AND FOREIGN COMPANIES IN FRANCE.

In connection with the above subject, on which an article appears in another part of the "JOURNAL" the following letter, signed by M. Pellerin, of Paris, which was published in the "Financial News" on Monday last week, will probably be read with interest.

The French Chamber of Deputies, while discussing the "Loi des Finances, 1906," has lately passed Article 13 of the Bill; and, as such article contains stringent provisions affecting French, English, and Foreign companies contemplating issuing shares or debentures, or whose securities may be dealt with in France, too great publicity cannot be given to the provisions. They will take effect from and after Feb. 1 next, if confirmed by the Senate. The following are the provisions of this new enactment:

Commencing from Feb. 1, 1907, any issue, negotiation, offering for sale, or sale of shares, debentures, or securities of whatever nature, in France, of French or Foreign companies, must comply with the following rules: All posters, prospectuses, advertisements in newspapers, circulars, forms of subscription or purchase, must contain the following details: As regards shares and debentures, the full name of the company or style of the undertaking, the nationality thereof, the registered office, its objects, the duration thereof, the nominal amount of the capital, the nominal value of each share and the amount remaining uncalled thereon, and the last balance-sheet of the undertaking, or a statement that the same has not yet been drawn up. In the case of shares, the advantages stipulated in favour of the following persons must be set out—namely, the directors, the manager, or any other person; a full description of the property conveyed to the company by the vendors must be given, the price contracted to be paid for same, the mode of convening general meetings, and the places where same are to be held. In the case of debentures, the following must be set out: The amount of debentures already issued by the company, and upon what security, details of which must be given; the number and the nominal value of the new debentures to be issued, the interest to be borne by each, and the date and the conditions under which same will be paid off.

The formalities above alluded to must be certified in the form of a notice as having been complied with by the parties issuing the securities, who must be domiciled in France. This notice must, prior to any advertisement whatever being issued, be published in a "bulletin" annexed to the "Journal Officiel," the form of which will be settled by a special decree. The fact of this notice having appeared, with a reference to the number of the "Journal" containing the same, must be inserted in all posters, prospectuses, articles in newspapers, and forms of subscription or purchase. All Foreign companies making a public issue in France of shares or debentures must, in addition, publish in the same "bulletin" annexed to the "Journal Officiel;" and before any issue is made, the Memorandum and Articles of Association of the company in question *in extenso* (translated into French). Any failure to comply with the above regulations will incur a penalty of from 10,000 to 20,000 francs.

The Minister of Finance stated that these new provisions had been brought forward in consequence of the enormous losses sustained in France during late years by all classes of shareholders who have invested in companies launched by promoters who have taken advantage of the laxity prevailing in this country relating to the issuing of shares and debentures, &c. It will be noticed that the regulations contained in Article 13 are largely based upon the provisions of the English Companies Act of 1900.

GAS COMPANIES AND CAPITALIZATION.

The "Joint-Stock Companies' Journal" for the 9th inst. contains an interesting communicated article on the above subject. It opens with a reiteration of the well-known truism that the prosperity of an undertaking depends in a great measure upon the economy with which it has been capitalized; and then the writer goes on to show that to no concerns is the remark applicable to so great an extent as to gas companies. The welfare of these undertakings depends, of course, on the price charged for gas. If this is high, they feel the competition of electricity; but if it is low, such competition will be arrested. The price of gas ranges between 2s. and 3s. per 1000 cubic feet in the case of companies supplying annually more than 500 million cubic feet; and in these figures the capital charges will range between 6d. and 1s.—varying according to the economy with which the company was capitalized at its inception, and the subsequent policy of the directors in apportioning expenditure. The writer refers to some of the factors which may be said to directly influence the prosperity of gas companies; and though he mentions cheap carriage of the raw material as a matter of considerable moment, he says it sinks almost into insignificance in comparison with low capitalization. To illustrate the importance of this matter to gas undertakings, he has taken as examples the eighteen largest companies in the United Kingdom, all of which supply upwards of 500 million cubic feet of gas annually. They are divided into two Groups A and B, representing the companies with capital charges below and above 9d. per 1000 cubic feet respectively.

Group A.			Group B.		
Name of Company.	Pence per 1000 Cubic Feet Sold.	Price of Gas.	Name of Company.	Pence per 1000 Cubic Feet Sold.	Price of Gas.
		s. d.			s. d.
Plymouth	5·33	1 9	Brentford	9·27	2 9
Wandsworth	6·69	2 0	West Ham	9·60	2 10
Tottenham	9·94	2 8	Commercial	9·67	2 5
Bristol	7·18	2 0	Croydon	9·73	2 8
Portsea Island	7·21	2 4	Derby	10·44	2 6
South Suburban	7·36	2 5	Brighton	11·37	2 10
Bath	7·56	2 1	Gaslight and Coke	12·16	2 11
Sheffield	7·61	1 6	Dublin	14·35	3 2
South Metropolitan	8·06	2 0			
Newcastle	8·25	2 0			
Average	7·22	2 1	Average	10·82	2 9

Sliding-Scale Companies.

Name of Company.	Standard Div. Per Cent.	Standard Price of Gas.	Present Price of Gas.	Price Below Standard	Rate of Div. for Each 1d.	Total Dividend Allowed.
		s. d.	s. d.	d.	s. d.	£ s. d.
Gaslight . . .	4	3 4	2 11	5	2 8	4 13 4
S. Metropolitan.	4	3 1	2 0	13	2 8	5 14 8
Commercial . .	4	3 3	2 5	10	2 8	5 6 8
	3½	..	..	..	3 4	5 3 4
Brentford. . .	10	3 9	2 9	12	5 0	13 0 0
	7	..	..	..	..	10 0 0
Croydon . . .	10	4 7	2 8	23	5 0	15 15 0
	7	..	..	..	..	12 15 0
S. Suburban. .	5	2 10	2 5	5	2 6	5 12 6
Tottenham . .	5	3 8	2 8	12	2 6	6 10 0
	3½	..	..	..	..	5 0 0
Wandsworth. .	3½ B	4 0	2 0	24	2 6	6 10 0
	3½ C	..	..	..	1 9	5 12 0
West Ham . .	5	2 11	2 10	1	2 6	5 2 6
Brighton . . .	10	3 3	2 10	5	5 0	11 5 0
	7	..	..	..	..	8 5 0
Newcastle . .	3½	2 9	2 0	9	2 6	4 12 6
Plymouth . .	7½	2 6	1 9	9	5 0	9 15 0
	7	..	..	..	..	9 5 0
	5	..	..	..	2 6	6 2 6
Sheffield . . .	10 max.	4 0	1 6	30	5 0	10 0 0
	8*	..	..	..	..	..
	7*	..	..	..	..	..
Dublin . . .	10	4 1	3 2	11	5 0	12 15 0
	7	..	..	..	..	9 15 0

* 10 per cent. is the maximum rate of dividend.

Attention is called by the writer to the undeniably close relationship between low capitalization and a low price of gas; and he goes on to say that theoretically, as the companies in Group B have to distribute on an average 3·6d. per 1000 cubic feet more than those in Group A, we might reasonably argue that the price charged by the former should be only about 3·6d. higher than that charged by the others. But, in reality, there is a difference of 8d., due to the fact that companies which are able to sell their gas at a low price may be said to kill competition, and so do a large business, while those that are saddled with a high price merely foster competition, and therefore are compelled to be content with a smaller volume of business. It is the company with a small capital who find it possible to lower their price; and, having done this, an increased business almost immediately follows.

The writer points out that, among the companies in Group A, Sheffield, owing to its close proximity to the coalfields, is able to supply gas at a very low figure; while the Tottenham and the South Suburban Companies, in spite of cheap capitalization, cannot, owing to comparatively bad situations for obtaining coal supplies, sell gas at low prices. Speaking generally, however, there is no doubt that the low prices for gas are due to economical capital charges; and this point is clearly emphasized if a comparison be made between the two groups. Certain of the companies in Group B bear unmistakable signs of the severe strain of heavy capital outlays—noticeably the Dublin and the Gaslight and Coke Companies. It is interesting to note that the Dublin Company, with a price (3s. 2d.) nearly double that of the Plymouth Company (1s. 9d.), can only boast of 60 consumers per mile of main; while the latter Company have no less than 300 to their credit. In this connection, it is also to be noticed that of the three large London Companies, the South Metropolitan, with the lowest price for gas (2s.), possess 244 consumers per mile of main, and are followed by the Commercial with 228, and the Gaslight and Coke with 214. Here, again, it will be remarked that the Company who charge the highest price for gas have to be satisfied with the smallest proportion of consumers. This is undoubtedly due to the high price of the latter Company, whose consumers would increase by 63,000 if a like number as the South Metropolitan Company have could be secured per mile of main.

Of the eighteen companies selected, fifteen work under the sliding-scale system. Consequently, the dividend may only be increased if the price of gas is reduced; and therefore it is imperative that the investor should make himself acquainted with the rate of dividend allowed for each reduction in the price, so that he may be able to judge of the respective merits of two or more companies. The preceding table shows the present position, and gives the necessary data from which the rate of dividend payable at any future time may be calculated, provided the price of gas is known.

The writer concludes by pointing out that, under the sliding-scale, the shareholders may only receive an increased dividend when the consumers are correspondingly benefited by a reduction in the charge for gas; and it is the latter who mostly gain from a reduction, as "they obtain over 80 per cent. of the monetary loss to the company." "To reduce the price of gas whenever possible is," he says "the undoubted policy of every well-managed company; and the above table shows that this policy has been adopted with considerable success in the past. It cannot be too strongly emphasized that a company with a low price of gas is calculated not only to withstand the severest competition on the part of electricity, but may also reasonably expect satisfactory yearly increases in business."

AMERICAN GAS AND RESIDUALS STATISTICS.

A report on the production of gas, coke, tar, and ammonia in gas-works and in retort coke-ovens during 1905 has been prepared by Mr. Edward W. Parker, of the United States Geological Survey. It is supplementary, in a measure, to the reports on the production of coal and the manufacture of coke, and has been made in response to a demand from producers of gas and coke and the bye-products of tar and ammonia for statistical information on these subjects.

The present report includes, in addition to the statistics of the production of gas, coke, tar, and ammonia at gas-works and in bye-products coke-ovens, a statement of the quantity of gas and tar produced at water-gas works using crude oil for enriching purposes. These statistics have not been considered in any of the preceding reports. At some of the works, oil is used with the coal in the production of gas, but the entire production is included in the statistics of coal gas. From an abstract of the report in "Progressive Age," we learn that in 1905 the total quantities of the products concerned was: 40,454,215,132 cubic feet of gas (not

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 141.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20½–21½	..	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14–15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾–7¼	+¼	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5–5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- 10 p.c.	28–29	..	4 16 7
51,810	10	,,	7	mouth Gas B 7 p.c.	17–17½	..	4 0 0
53,200	10	,,	6	and Water Pref. 6 p.c.	15–16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260–265	..	4 14 4
300,000	,,	,,	9½	Do. New	203–205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101–104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230–235	..	4 15 8
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163–168	..	4 18 3
460,000	20	Sept. 27	10	British	41–43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121–125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91–94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½–12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
150,000	20	July 12	8¼	Cagliari, Ltd.	24–26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9½–9¾	..	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50–52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96–98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½–110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅞	Commercial 4 p.c Stk.	110–113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107–110	..	4 10 11
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83–85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124–127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138–143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105–107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24⅜–25⅜	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅝	Gas- 4 p.c. Ord.	99–101	+½	4 7 2
2,600,000	,,	,,	3½	light 3½ p.c. max.	88–90	..	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	107–110	..	3 12 9
4,193,975	,,	Dec. 13	3	Coke 3 p.c. Con. Deb.	84–86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98–103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118–121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½–20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	177–180	+½	4 8 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95–97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120–125	..	4 16 0
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	110–112	..	3 11 5
561,000	Stk.	Aug. 30	10	Liverpool United A	227–229	−2	4 7 4
718,100	,,	,,	7	Do. B.	167½–163½	..	4 3 1
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c.	145–150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼–4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101–103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101–103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½–12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110–111	−½	4 3 4
406,625	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96–97*	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20–21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅜–14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150–155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6–6½	+¼	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅛–8	+¼	4 7 6
796,980	5	July 27	5	Do. 5 p.c. Pref.	5¼–5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼–12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95–97*	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13¼–13¾	..	5 16 5
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50*	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248–250	..	4 0 0
209,984	,,	,,	10	Do. B	248–250	..	4 0 0
523,500	,,	,,	10	Do. C	248–250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½–16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128–130	..	4 4 7
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	85–87	..	3 9 0
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	156–158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123–126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123–126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128–133	..	3 15 2
502,310	Stk.	Nov. 14	5	Southampton Ord.	105–110	..	4 10 11
120,000	Stk.	Aug. 30	6½	Tottenham A 5 p.c.	127–130	..	5 0 0
388,020	,,	,,	5	and B 3½ p.c.	104–106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton 4 p.c. Deb.	101–103*	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½–11*	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102–104*	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106–108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth B 3½ p.c.	140–145	..	4 9 8
75,000	,,	,,	5⅝	and C 3½ p.c.	113–115	..	4 17 6
79,416	,,	Dec. 28	3	Putney 3 p.c. Deb. Stk	79–82*	..	3 13 2
779,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	103–105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	120–123	..	4 1 4
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	101–104*	..	3 16 11

Prices marked * are "Ex div."

including that lost or wasted), 5,751,378 short tons of coke, 80,022,043 gallons of tar, 38,663,682 lbs. of sulphate, and 46,986,268 gallons of ammoniacal liquor; against 34,814,991,273 cubic feet of gas, 4,716,049 short tons of coke, 69,498,085 gallons of tar, 52,220,484 gallons of ammoniacal liquor, and 28,225,210 lbs. of sulphate in 1904. The total value of all these products in 1905 was $56,684,972, compared with $51,157,736 in 1904.

Oil and Water Gas.—Returns were received from 477 companies producing oil and water gas; and these show that the total production of water gas in 1905 was 82,959,228,504 cubic feet. Of this quantity, 5,547,203,913 cubic feet, or 6·7 per cent., was lost by leakage, &c.; leaving 77,412,024,591 cubic feet as the net production obtained and sold. As the quantity of gas made and sold at the coal gas and bye-products coke-oven works was 40,454,215,132 cubic feet, it seems that the consumption of water gas and gas made from crude oil was nearly twice as much as that produced from coal. It also appears that, while the average price of coal gas in 1905 was 81·4 c. per 1000 cubic feet, that of oil and water gas combined was a fraction of a cent in excess of $1. Still further comparison shows that whereas 66 per cent. of the production of coal gas was sold for lighting, 77 per cent. of the combined production of oil and water gas was used for this purpose.

Coal.—For the fourth time in the history of the United States, the production of coal in 1905 reached a total of more than 300 million short tons; showing an actual output of 392,919,341 tons of 2000 lbs., valued at $476,756,963. Of this total, the output of anthracite coal amounted to 69,339,152 long tons (equivalent to 77,659,850 short tons), which, as compared with the production of 65,318,490 long tons in 1904, was an increase of 4,020,662 long tons, or 6 per cent. The value of the anthracite coal at the mines in the year 1905 was $141,879,000, against $138,974,020 in 1904. The output of bituminous coal (which includes semi-anthracite and all semi-bituminous and lignite coals) amounted in 1905 to 315,259,491 short tons, valued at $334,877,963, compared with 278,659,689 short tons, valued at $305,397,001, in 1904. The increase in the production of bituminous coal in 1905 over 1904 was therefore 36,599,802 short tons in quantity and $29,480,962 in value.

Coke.—The coke production of the United States in 1905, which included the output from 3159 retorts or bye-products ovens, amounted to 32,231,129 short tons, compared with 23,661,106 short tons in 1904. The increase in the quantity in 1905 over 1904 was 8,570,023 short tons, or 36·22 per cent. The total value was $72,476,196, against $46,144,941 in 1904—a gain of $26,331,255, or 57 per cent. The average price per ton in 1905 was $2·25, against $1·95 in 1904. The average output from the bye-products ovens in 1905 was 1158·8 tons per oven, against an average of 365·8 tons per oven from the beehive ovens.

Gas, Coke, Tar, and Ammonia.—The aggregate value of all the products obtained from the distillation of coal in gas-works and retort-ovens in the year 1905 was $56,684,972, against $51,157,736 in 1904 and $47,830,600 in 1903.

Natural Gas.—The value of the natural gas produced in 1905 was $41,562,855, compared with $38,496,760 in 1904, $35,807,860 in 1903, $30,867,863 in 1902, $27,066,077 in 1901, and $23,698,674 in 1900—a gain of about 8 per cent. in 1905 over 1904.

Petroleum.—The total production of crude petroleum in the United States in 1905 was 134,717,580 barrels, against 117,080,960 barrels in 1904, 100,461,337 barrels in 1903, 88,766,916 barrels in 1902, and 69,389,194 barrels in 1901—an increase of 17,636,620 barrels, or 15 per cent., over the production of 1904, and of about 34 per cent. over that of 1903. The value of crude petroleum produced during 1905 was $84,157,399, or an average price of 62·47 c. per barrel, against $101,175,455, or 86·41 c. per barrel, in 1904, and $94,694,050, or 94·26 c. per barrel, in 1903.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

To-night's meeting of the Western District of the Scottish Junior Gas Association can be regarded in no other light than as a continuation of the high level of excellence to which the Association, in its as yet brief existence, has attained. If anything, the *agenda* to-night was too full; for either of the subjects dealt with would have been sufficient of itself to have made the meeting quite illustrious. The evening was purely a Glasgow one, so far as the subjects were concerned; and of the speakers, only one hailed from outside the city boundaries—which reveals once more, if that were really needed, the wealth of ability that is to be found in and around the great hive of industry which is contained under the dome of the Glasgow Corporation Gas Department. The papers were read first, and the discussion was intended to be taken upon both together; but, somehow, perhaps quite naturally, the subjects separated themselves, and did not commingle. This did not, however, detract from the value of the remarks which fell from the speakers. Mr. John Wilson led off with a description of the gas-turbine which has been installed at Provan, and gave an account of this wonderful machine, by letterpress and illustration, which must have been, to many, the first enlightenment as to the construction and working of the interior of the now world-famous steam-turbines. From the remarks of Mr. Alex. Wilson, it appears that the idea of using the Parsons turbine originated with him, and even that he had some difficulty in getting his idea carried into effect. According to Mr. Lowe, theoretically, the machine is not an ideal one. After the testimonies, however, of Mr. Wilson, the author, of Mr. A. Wilson, the Engineer, and of Mr. J. Webster, the Manager at Provan, it would appear that, for efficient and economical working on a very large scale, the turbine gas-exhauster is a great success, and will, whatever advance may be made on it, never be gone back upon. A word of praise is due to Mr. John Wilson for his very clear and full statement of the form, and of the working, of the turbine; and the tests which he gave, for which he acknowledged his indebtedness to

RADIATOR PICTURES, No. 13.

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ROTHESAY PARISH CHURCH.

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Mr. J. Lowe, are a complete vindication, were they nothing else, of the adoption of the turbine exhauster. Mr. Wilson having dealt with a mechanical subject, Mr. J. M. Popplewell, the Chemist in the Chemical Works at Provan, which are leased from the Corporation by Messrs. Brotherton and Co., Limited, of Leeds, followed with a severely scientific subject—coal-tar distillation. Mr. Popplewell treated the subject happily; giving both present satisfaction to the members and powerful aid, as well as stimulus, to them to use the information he gave in future investigations which they may conduct on their own behalf. After the meeting, the feeling was that this season the Western District are having a most satisfactory time.

The advertisements which were issued by the Corporation of Falkirk, inviting applications for the post of Gas Manager, have been responded to by forty gentlemen. The applicants reside in all parts of the United Kingdom. On Tuesday of this week, the Town Council held a special meeting, at which the applications were opened. They were then remitted to the Gas Committee, who will meet next week to draw up a short leet.

The subject of the carriage of coke from Dundee occupied the attention of the Town Council of Dundee on Thursday. Lord Provost Longair referred to the resolution which had been adopted by the Council at a previous meeting, in his absence, to oppose the proposals of the Harbour Trustees and the Railway Companies as to the carriage of coke from the gas-works to the harbour. The latter two parties have entered into an agreement to the effect that not more than 1000 tons of coke be carried in any one year. The position taken up by the Railway Companies was that the lines were congested with passenger traffic, and that for the public safety they could not undertake the work. He moved that they do not oppose. Bailie Melville, who moved that they adhere to their opposition, objected to the Harbour Trustees legislating for the Corporation. Several other members having expressed their opinion, the Lord Provost, on account of the strong feeling in the Council on the subject, withdrew his motion, and it was agreed to continue the opposition.

The want of lighting facilities in Fauldhouse—a village of about 3000 inhabitants, in Linlithgowshire—is being felt. On Monday evening, a meeting of the inhabitants was held to consider the subject; and a Committee was appointed to obtain information regarding the lighting arrangements in neighbouring villages. Some of the speakers advocated the formation of a Gas Company. In the neighbouring village of Shotts, a Gas Company was formed three years ago; and the success which it has attained, and the satisfaction it has afforded to the community, are probably factors in the movement which has now been initiated at Fauldhouse.

The petition by Wm. Glass and others, asking that the Grantown Gaslight Company, Limited, be wound up under the supervision of the Court, which I mentioned in my "Notes" of Dec. 25 last, was granted by the Second Division of the Court of Session yesterday, without any opposition having been offered. The liquidation was placed under the supervision of Lord Dundas.

At the Peterhead Town Council on Monday, it was reported by the Gas Manager—Mr. W. Ritchie—that the gasholder accommodation was insufficient, and he proposed that Nos. 1 and 2 holders be removed and replaced by others, and that a third one be erected upon a site where a holder previously existed. This would give four holders of 45,000, 47,000, 112,000, and 25,000 cubic feet capacity respectively—a total of 229,000 cubic feet. The estimated cost is £2250. The Town Council adopted the proposal. The maximum daily make of gas is 191,600 cubic feet. The Manager was also, on his own recommendation, authorized to lay enlarged mains in various parts of the town.

Complaints as to the public lighting of Montrose have become so loud that notice of them was taken in the Town Council on Monday, and it was resolved to send a protest in the matter to the Electric Lighting Company who have the contract for the lighting.

A novel fire alarm is intimated from Edinburgh, but one which cannot be depended upon to act satisfactorily in daily use. On Wednesday morning, a medical gentleman was awakened by the violent ringing of his telephone bell. When he got up he discovered that his house was on fire, and he summoned the Fire Brigade, who succeeded in extinguishing the flames, though not till considerable damage had been done. The telephone had been set a-ringing by the heat of the fire having fused a telephone wire, which then came into contact with a gas-pipe, and thus made a short circuit.

An Aberdeen Suicide by Gas.—On the morning of Sunday, the 6th inst., Wm. M'Donald (66), a granite cutter, was found dead in bed in his house in Jute Street, Aberdeen. His death was self-inflicted, as it was found that he had attached a piece of india-rubber tubing to an open gas-tap, and placed the other end in his mouth. He had been in ill-health and depressed in spirits.

Thefts from Prepayment Meters.—At the County of London Sessions last Wednesday, William Grossman and Robert Williamson pleaded "Guilty" to stealing money from prepayment meters, the property of the South Metropolitan Gas Company. Previous convictions for similar offences having been proved, prisoners were sentenced to fifteen and twelve months' imprisonment respectively, with hard labour.

Welsh Authorities and the Birkenhead Water Scheme.—At a special meeting of the Denbighshire County Council, held for the purpose of considering the advisability of opposing the Welsh water scheme of the Birkenhead Corporation, the following resolution was passed: "That the Council approve of, and concur in, the opposition by the Flintshire, Anglesey, Carnarvonshire, and Merionethshire County Councils, and the Visiting Committee of the North Wales Asylum, or the combined opposition of such Councils, &c., to the Birkenhead Corporation Bill; that the said Visiting Committee be authorized to take all such proceedings as may be necessary in the matter; and that the proportion of the expense due from the Council in connection therewith be defrayed out of the county fund and rate."

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Telegrams: WILLEY, EXETER.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 12.

Sulphate of Ammonia.

There has been more interest in the market during the week and more buying; but supplies have been fairly plentiful, and any improvement in values has only been fractional. The closing quotations are £11 12s. 6d. per ton f.o.b. Hull, £11 15s. per ton f.o.b. Liverpool, and £11 17s. 6d. per ton f.o.b. Leith. Efforts have been made to get in at about prompt prices for February and March delivery, but without much success; makers being inclined to wait for a recovery in values, and speculators being nervous about taking liberties with the market for delivery ahead at near the present level.

Nitrate of Soda.

This article is steady at 11s. 3d. per cwt. for 95 per cent., and at 11s. 9d. for refined quality.

LONDON, *Jan.* 12.

Tar Products.

Markets have been generally firm during the past week, with the exception of pitch, which remains very dull. Business is reported to have been done in London at under 25s. for prompt delivery, and probably a further quantity could be secured at this figure. On the east coast, pitch has been offered at 24s. 6d. and refused; while contracts have been made at other places on the east coast at 24s. for delivery over the next 3-4 months. On the west coast, it is reported that pitch has been offered at 24s. 6d. without success; but in some places difficulty has been experienced in securing small quantities to complete prompt shipments, and fair prices have been paid. Rather good business has been done in South Wales for delivery from now to the end of June at market prices; but the demand from the Continent is slight. Creosote is very firm, though in London some quantity of oil has lately been sold at 2d. per gallon for prompt delivery. In the Midlands, very little can be secured; while in the North makers are evidently well sold, and will not give any consideration to less than 2d. all round at their works. In carbolic acid, Continental consumers report that they are securing supplies at 1s. 8½d. for 60's.; while English consumers refuse to offer more than 1s. 8d. at makers' works. There is no alteration reported in the market for crystals. Solvent naphtha is firm, makers quoting from 1s. 2½d. to 1s. 3d. on the east coast; while in London, 1s. 4½d. to 1s. 5d. is asked for small quantities for prompt delivery. For forward, makers do not care to quote. Toluol is steady for both pure and 90 per cent.; and prices remain unchanged. Benzol is scarce in London; but in the North, lower prices are reported to have been accepted. There is no alteration in the quotation for 50-90 per cent. A fair quantity of tar has been sold in London at a very low price delivered to distillers' works.

The average values during the week were: Tar, 13s. to 17s. Pitch, London, 24s. 9d. to 25s.; east coast, 24s. to 24s. 6d.; west coast, 24s. to 25s. Benzol, 90 per cent., 11½d. to 1s. 1d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4⅜d. to 5¼d.; solvent naphtha, 1s. 2⅜d. to 1s. 4⅝d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2d. to 2¼d.; North, 1⅞d. to 2d. Heavy oils, 2⅛d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 9d. Naphthalene, £4 10s. to £9 10s.; salts, 33s. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market is quiet. Towards the end of the week, however, there has been a decidedly steadier tone; and it appears probable that we have seen the bottom. No business of importance has been reported in London, though doubtless ordinary makers would accept less than the nominal quotation of £12 2s. 6d. made by the principal Gas Companies. In Hull, £11 15s. has again been paid for best makes; but no business is reported in ordinary qualities. In Liverpool, the value may be taken as £11 15s; while in Leith, the nominal quotation is £11 17s. 6d. In all quarters there is a desire to buy for forward delivery; but at present the premium asked by makers is no encouragement.

Fatal Gas Explosion.—News reached London yesterday from various sources of an explosion of a gasholder at Montagnana, a town near Padua, with 12,000 inhabitants, on the night of Wednesday last. Three workmen were killed, and several others badly wounded. The whole town was plunged in darkness.

Cardiff Water Supply.—The Water Committee of the Cardiff Corporation have decided to ask the permission of the Council to take preliminary steps in connection with the construction of another reservoir in the Taff Fawr Valley. The new reservoir will be the largest of the three, and will have a capacity of 900 million gallons; the capacities of the other two being 322 and 345 million gallons respectively. Mr. C. H. Priestley, the City Engineer, has drawn up a report on the water supply during the past year, in which he states that 603 new services were connected, compared with 342 in 1905. The average consumption per day was 5,646,383 gallons, or 26·26 gallons per day per head on an estimated population of 215,000. The quantity of water pumped at Cogan during the year was 212,400,000 gallons, compared with 117,393,000 gallons in 1905.

A Leaking Submerged Water-Main.—A difficulty has again arisen through a leakage in the water-main which serves Saltash. The supply is derived from the Plymouth Water-Works, and is conveyed to Saltash in a 5-inch main laid with flexible joints under the River Tamar. The bed of the river is very uneven, so that the pipe is only imperfectly supported; and probably from this cause leakages have occasioned some trouble. In the present case, the divers have located the fracture at a spot where the river is 56 feet deep, and a layer of 3 feet of mud covers the pipe. The work of repairing the damage under such circumstances is difficult and costly. The Saltash Corporation are anxious to enter into an arrangement with the Great Western Railway Company for the laying of the main along the Royal Albert Bridge; but the Company do not appear desirous of allowing this to be done.

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CONVEYORS, ELEVATORS,

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NEW CONVEYOR CO., LTD., SMETHWICK.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The demand for coal for commercial purposes at present is almost greater than the supply. Colliery proprietors, however, are not wholly to blame for this. They have not had empty trucks returned to the pits as regularly as hitherto, and consequently could not get the stuff away. There has been no difficulty in getting from consumers the newly enhanced prices for coal. Prices therefore remain steady. Contracts for gas coal and cannel are being considered. An advance on last year's contracts, judging from present circumstances, will be general. Quotations in the Lancashire district are: Best house coal 14s. to 15s. per ton, secondary 13s. to 14s., common 9s. 6d. to 12s. 6d., burgy 8s. to 9s., best slack 7s. 3d. to 7s. 9d., medium 7s., common 6s. to 6s. 9d., coal for bunkers 10s. to 10s. 6d., and furnace coke 17s. to 24s.

Northern Coal Trade.

The coal trade is now more active; the production at the collieries is fuller, and there is a demand that takes it up well. But with the greater output and the satisfying of the demand, prices show a little ease for some classes of fuel. In steam coals, the quotation is now based on about 12s. 6d. per ton f.o.b. for best Northumbrians, and about 11s. 6d. for second-class steams. Steam smalls are now rather less scarce, and the quotation is from 7s. to 7s. 6d., with a fair request for this season of the year. In the gas coal trade, the demand continues very full; and as stocks were reduced in the holiday period, the great users are taking coal freely for purposes of replenishment. Durham gas coals vary from about 10s. 6d. to 11s. 6d. generally, according to quality; but the very best classes are quoted up to 12s. 6d. per ton f.o.b. At the same time, the period of the highest consumption of gas coal is now passing, and a week or two may ease the demand. As to contracts, the tenders are in for the Copenhagen Gas-Works, at higher figures; but no settlement is reported as yet. The inquiry for coke is very full, and prices are high; but this is partly due to scarcity. Gas coke is steady; and the price may be put as about 13s. 6d. per ton f.o.b. for good descriptions, on the Tyne.

Scotch Coal Trade.

Trade has started off with undiminished vigour, and there is every appearance of its continuing to be active for some time. Prices are still rising. The quotations are: Ell 10s. 6d. to 11s. 9d. per ton f.o.b. Glasgow, splint 11s. 9d. to 12s., and steam 10s. 6d. to 10s. 9d. The shipments for the week amounted to 97,787 tons—a decrease of 158,089 tons upon the previous week, and of 4878 tons upon the corresponding period of last year.

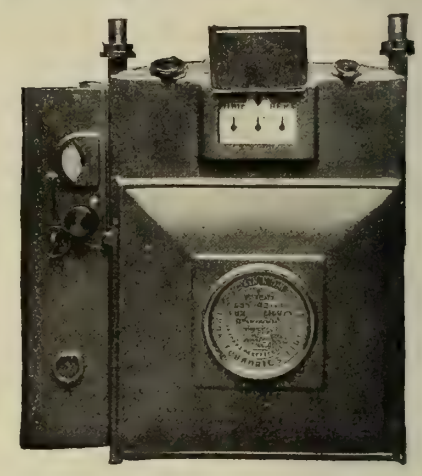
Gas Supply of Bilston.

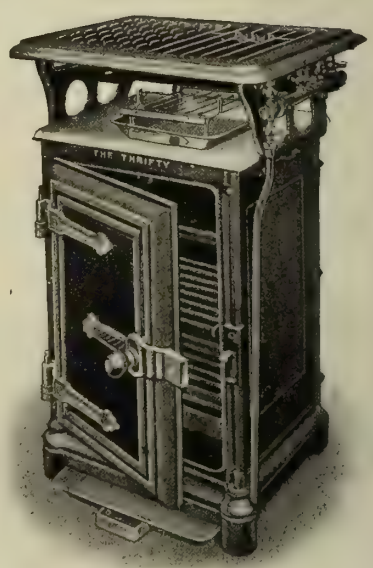
At the annual meeting of the Bilston Gas Company on Monday last week, when moving the adoption of the report of the Directors, noticed in the "JOURNAL" for the 1st inst., the Chairman (Mr. Harold Holcroft) observed that during the year they had maintained their position, notwithstanding the fact that the sales of gas showed a small decrease. This was due to several causes. There was a general adoption of incandescent burners, which effected a saving to the customers of one-third of the quantity of gas used without them. In the long run, there was no doubt these incandescent burners would be to the advantage of the Company. At a low estimate, in a small district like theirs, the effect was a saving to the consumers of from 10 to 15 million cubic feet of gas. The fact that some of the large consumers were using waste power at their works to generate electricity, also made a difference to the Company. One feature of importance was that they suffered from the difficulties of being in a mining district; and, though the coal was supposed to be worked out, the ground had not settled, and the number of broken mains was astonishing. There had, however, been an improvement in this respect by 2 per cent. With regard to the sale of residuals, they had not showed any great vitality. The sulphate of ammonia market was stationary; while tar had a downward tendency. Mr. J. Jones seconded the motion. Mr. R. D. Lewis supported it, appealing to the Directors to adopt a more progressive policy, and offer an inducement to small consumers. The Chairman said they did not fear competition from the electric light, and they were getting more smaller consumers; but it took a large number of them to make up for the loss of one large consumer. The report was unanimously adopted, and it was decided to pay further dividends of 5s. 6d. and 4s. on the "A" and "B" shares respectively, in addition to the interim dividend. The retiring Directors and Auditors having been re-elected, the Chairman referred to the death of Mr. Reeves, the Engineer and Manager, who had been connected with the Company for 43 years; and he mentioned that Mr. W. H. Adams, late Manager of the Gosport Gas Company, had been appointed in his place.

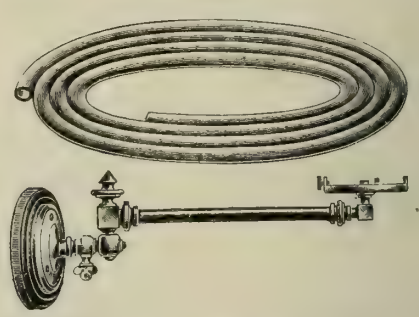
A failure of the electric light in the neighbourhood of Hammersmith caused much inconvenience last Wednesday evening. Olympia was in darkness for about ten minutes; and then gas was utilized as an illuminant.

In the "JOURNAL" last week, we called attention to an effective leaflet issued by Mr. James Paterson, the Engineer and Manager of the Redhill Gas Company, setting forth in a striking manner the advantages of gas as compared with the electric light. We find that something on the same lines has been done by Mr. E. S. Pike, the Secretary of the Reigate Gas Company. He has selected a pair of scales as his medium; and on his leaflet he shows by the angle of the beam the value of an incandescent gas light as compared with an electric glow lamp. He urges his reader to "Be wise and have a balance on the right side;" in other words (as fully set forth in bold type), to have a light of 80 candles for seven hours for 1d. by gas, instead of paying 1s. for it by electricity, which sometimes leaves its user in the dark. The competition of electricity has evoked a good deal of advertising ingenuity which would otherwise have lain dormant; and it must be productive of good results to the gas industry.

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and Box No. 4 (G.P.O.) Dunedin.

New Water-Works for Wolverhampton.

Mr. P. M. Crosswaite, on behalf of the Local Government Board, held an inquiry last week into an application by the Wolverhampton Corporation for sanction to borrow £90,000 for the purposes of the water undertaking. The Town Clerk (Mr. H. Brevitt) explained that the water area comprised 42,750 acres, the dependent population was 150,000, and the houses 33,372. In 1845, the water undertaking belonged to the old Wolverhampton Water-Works Company, who erected a pumping-station and constructed a well at Tettenhall. Between 1851 and 1852, the same Company erected a pumping-station and sinking at Goldthorn Hill, where there was also a covered reservoir. In 1856, the Wolverhampton New Water-Works Company came into existence, and purchased the undertaking of the old Water Company. This Company constructed a pumping-station at Cosford and a reservoir at Tettenhall; and in 1868, the works were acquired by the Corporation. The present yield was slightly over 4 million gallons daily; and the estimated consumption for all purposes was 21·57 gallons per head. With regard to the cost of the proposed new works, the Town Clerk explained that £5000 had to be paid to the Staffordshire and Worcestershire Canal Company as compensation. The preliminary expenses were to be put down as £2000 odd; and the trial boring and testing operations at Tettenhall—which had been eminently successful both in respect of the quantity and quality of the water—involved an expenditure of £2000 odd. The permanent boreholes, which would be sunk to a depth of 1000 feet, together with their lining tubes, would cost £6000. There would be no charge on the rates of Wolverhampton in respect of the proposed new works. The Borough Analyst (Mr. Jones) said he had tested the water; and organically it was better than their present supply. In time, the Wolverhampton water would be better than it had ever been.

Birmingham Water for Coventry.

At a public meeting held last Thursday, the ratepayers of Coventry approved of the scheme for obtaining a supply of water from the Shustoke reservoir of the Birmingham Corporation; and the Bill to enable this to be done will therefore be proceeded with. The meeting was not a large one; but 76 voted for the proposal, and only 2 against. Alderman Bird, the Chairman of the Water Committee, explained the need for an increased supply, and outlined the scheme. He said that, in the first place, Coventry, at its own expense, was to lay a line of pipes to connect their reservoirs with the delivery main from the Birmingham pumping-station at Whitacre. Birmingham was to deliver into the pipes such a supply of water, not to exceed at any time 2 million gallons per day, as Coventry might from time to time require; and Coventry was to pay Birmingham for the water supplied at the rate of 4d. per 1000 gallons, subject to a minimum rate of £1250 per quarter—this rate to entitle Coventry to a minimum supply of 75 million gallons in that quarter. Nothing in the agreement was to be construed as a guarantee of purity; but Birmingham was to use all reasonable care and diligence to prevent pollution, and to secure the purity of the water delivered to Coventry. If at any time the water failed to reach the standard of purity reasonably required by Coventry, the city might terminate the agreement or require Birmingham to provide a supply of Welsh water, instead of water from the River Bourne. The price was to be mutually agreed between Birmingham and Coventry, or, failing agreement, to be settled by arbitration. The estimated expenditure on the main and the subsidiary works and the reservoirs for the storage of the water required for an additional supply—whether the water was obtained from Birmingham, as proposed, or from any other source—was £81,000. Power was also being sought by the Bill to borrow such further money as might be necessary for any of the purposes of the undertaking. Reference was also made by Alderman Bird to the larger needs of the future; and he explained that, though they would take 2 million gallons a day, Whitacre could supply them with 10 million gallons.

Increased Sale of Gas at Winchester.—In spite of very keen competition from the Winchester Electric Light Company, the output of gas by the Water and Gas Company during the six months ending the 31st of December last was 5 per cent. greater than in the corresponding period in 1905. Another gratifying feature of the half year's working has been that the efforts of Mr. H. C. Head, the Company's General Manager, to reduce the unaccounted-for gas have been rewarded by the fact that whereas the quantity of gas sent out is only 5 per cent. more, the gas actually sold is 8 per cent. greater.

The Empire Light Company, Limited, has been registered with a capital of £10,000, in £1 shares.

The £3000 of perpetual 4 per cent. debenture stock of the Guildford Gas Company, recently created, has been sold by tender; the average price realized being £102 6s. 2d. per £100.

An announcement which recently appeared in the "JOURNAL" notified that the Tottenham and Edmonton Gas Company are about to sell by tender £11,970 of 4 per cent. perpetual debenture stock, at a minimum price of £104 per £100. This is the remaining portion of the amount authorized by the Company's Act of 1898 to be raised by the issue of debenture stock. Tenders will be received up to Monday, the 28th inst., and interest will accrue from the 1st prox.

It is reported that the contract for a power-gas installation at Fuji, near Yokohama, Japan, has been given to the Power-Gas Corporation, Limited, of Stockton-on-Tees. The gas plant will have a rated capacity of 3000 I.H.P., designed to produce about 180,000 cubic feet of gas per hour from local fuels. The whole of the gas will be cleansed and made suitable for use in engines.

We have received from the Pneumatic Gas Lighting Company, Limited, their new season's catalogue, which shows that the Company are introducing many improvements. It has been compiled on totally different lines from their last year's issue; the matter being put in a more convenient form for buyers. The Company have carried out some very successful installations in churches; and their tender for the lighting up of the Bethnal Green Fire Station, under the London County Council, has just been accepted.

THE "BLAND" LIGHT IN CHURCH.

ACTUAL FACTS

ST MARY'S HOUSE.
ROSS.

4th Jany 1907

Dear Sirs

I have to day received from the Ross Gas Co. the amount of Gas Consumed in Ross Church during Xmas Quarter 1906.

The Queen of the Bland Burner has exceeded my expectations.

The Saving on this quarter alone has been 33,400 ft. to the value of £6. 13. 7.

Yours Truly

Xmas Qr. 1905
Naked Burners 65,200

Xmas Qr. 1906
Bland Light 31,800
33,400.

During the Whole of this past Quarter we have not received a single mantle or globe.

Yours faithfully
W. Watson
Churchwarden Ross Parish Church

For full details respecting the "Bland" Light for
CHURCH, FACTORY, SHOP, & DOMESTIC LIGHTING,
WRITE TO—
BLAND & CO., 63, Queen Victoria St., London, E.C.

Opinions regarding electricity, we know, differ; and the fact was emphasized a few days ago during the hearing of a case in which a Leeds firm of clothiers were summoned for breaches of the Factory and Workshops Act. The Inspector complained of the lack of ventilation; and he suggested that the conditions could be materially improved by giving up gas and using electric light, and by mechanically introducing fresh air by means of fans. On the other hand, however, a member of the firm said he did not feel inclined to put electric light in the premises, because it injured the eyes and everything else. He did not think their girls could work with it.

At the meeting of the Rochdale Corporation Gas Committee, last Wednesday, the Whitworth District Council again wrote asking Rochdale to supply gas in the Whitworth Valley; but for various reasons the Committee decided that they could not grant the request.

The Directors of the Walker and Wallsend Gas Company recommend the following dividends for the past year: Upon the preference stock, at the rate of 5 per cent. per annum; upon the 3½ per cent. ordinary stock, at the rate of £4 17s. 6d. per cent.; and upon the 5 per cent. ordinary stock, at the rate of £6 7s. 6d. per cent. These are the maximum dividends.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Calne Gas and Coke Company. Applications by Jan. 21.
GENERAL FOREMAN. No. 4691.
WORKING CARBONIZING FOREMAN. No. 4696.
TRAVELLER. No. 4699.
REPRESENTATIVE (Coal). No. 4694.
SUNDRIES AND STORES CLERK. No. 4690.

Situations Wanted.

POSITION IN OFFICE OF CONSULTING ENGINEER (View to Partnership). No. 4695.
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Stocks and Shares.

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High Pressure Distribution. No. 4693.

TENDERS FOR

Coal.

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Fire-Clay Goods.

BURY GAS DEPARTMENT. Tenders by Jan. 19.

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PLYMOUTH LIGHTING DEPARTMENT. Tenders by Jan. 31.

Retort-Bench Brickwork.

BURY GAS DEPARTMENT. Tenders by Jan. 22.

Washers.

MANCHESTER GAS DEPARTMENT. Tenders by Jan. 21.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1907, are reminded that this can only be done during the current month.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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(NATURAL.)
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BALE'S FIRE CEMENT.
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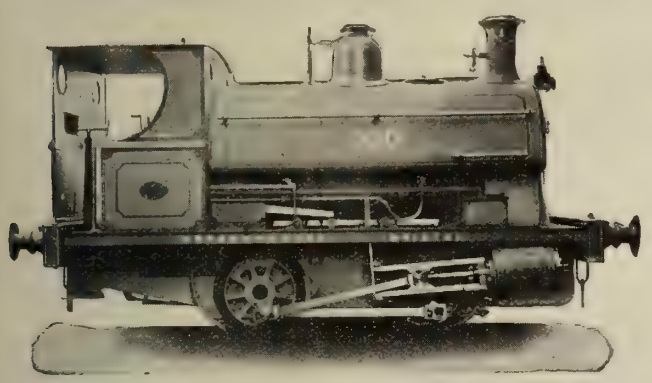
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EDITORIAL NOTES—GAS, &c.

Improving the Existing.

THE trend of gas invention, as portrayed by the abstracts of patent specifications published, as regularly as circumstances will allow, week by week in the "JOURNAL," must always remain a fascinating study for those who are concerned in the technical progress of the industry. We are at the present in an extremely interesting position in all the many branches affecting gas production and utilization. The past few years have witnessed in almost every direction material advance in the way of complete departures from the old forms of doing the same things, for the purpose of achieving further economy and realizing generally more brilliant results. But—if we except for the moment the vertical retort system, whose best lines are still in an indeterminate state—what is being largely striven after in the present, in every line of inventive activity, is the improvement of the efficiency of the latest approved types without seeking any further radical departures such as latter years have seen. There appear to be stages in inventive progress when new openings are completely concealed from view, and when the inventor and the searcher after fresh light and truths are restrained by hidden forces to the penetration of those secrets that yield from the existing increased profitable results to the common advantage. Go for illustration to the greatest of all the examples of applied mechanics—the steam-engine. After the advent of this engine, generations of engineers came and went, and long years passed; but all the while men and time were devoted to the gaining, from the same fundamental principles, of greater efficiency—to the realizing of greater effective power from the fuel consumption. But it is only in the latter years that we have the radical departure in the shape of the steam-turbine, to the further improvement of which—by the eradication of defects, and by obtaining from it still higher efficiencies upon those already high—work is being unremittingly directed.

The simile will be found to be strikingly comparable with the technical situation in the gas industry on reading the article on "The Trend of Gas Invention" in another part of this issue. If we look at the section of carbonization, the whole of the work that is going on now does not by any means partake of any radical departure from now established lines, other than in the adaptation of the vertical retort to the conditions and requirements of the gas industry, and the supplementing of that system with those mechanical habiliments for which it is so peculiarly fitted, and by the aid of which it is fervently hoped there will be produced a combination of economical result that will raise the system superior to all that at present exists. True the task that the vertical retort improvers have undertaken is a large one, in view of the continuous labour, with the same objects, in connection with existing retort-house methods. That is where technically in all branches we are at present. Experimenters and inventors are attempting to raise the productive and effective status of what is already in being, without any abandoning of hopes that from beyond the limits of contemporary knowledge there are great reserve forces for the gas industry still waiting to be revealed. In retort furnaces and settings, our "Register of Patents" shows us there are spasmodic endeavours to further improve upon the already high efficiency derived from them. In the structural form and setting of retorts, the same. In the charging and discharging of horizontal retorts, the departure of a few years since that made operation possible from one end of the retorts, has been accepted; and there has appeared nothing of late that is both new and practicable that is a desertion from the approved rotary projector or the system of charging and discharging in one operation. The fundamental lines and principles remain; and the work that has been going on, in connection with both systems, has been kept in the channel of effort to improve or vary means. There has been more or less success—success chiefly in producing the same effect by a change of method, though not always without a little diversion from simplicity to complication. It is expected that we shall shortly see demonstrated a new example of the type of machine which expels and recharges in one operation. To coal and coke elevators and conveyors, the foregoing remarks will also apply. Certain principles of construction have been stereotyped; and improvement at the present time is being sought in detail. And so through all the other departments of manufacture and distribution, until we come to the utilization of gas.

In the utilization of gas, the review of invention reminds us, a similar condition prevails; and, indeed, no one expects, in this direction or in any other, that new departures will be matters of daily occurrence. After the discovery of the incandescent mantle, and its adaptation to the vertical bunsen burner, the first great diversion from common use was the outside accompaniment of high-pressure gas, or else high-pressure air, and following this the successful combination of inverted bunsen burners with the mantles. The day is remote as things move now when these things came to aid in the utilization of gas; and investigators and inventors have not discovered any new thing to supersede them, but have concentrated attention upon their improvement, and most successfully. We do not believe that the end in economy and efficiency has been reached with the means now available. There are, our "Register of Patents" is constantly reminding us, many who labour to that end; but from their work, and from what at present exists, we cannot yet see, nor are there signs on which anyone can venture to predict, where, when, or how something that can be called a really new departure in gas lighting is likely to arise.

All are at present highly satisfied with what are the possessions of the gas industry. Even so, the resources of the industry are large, the field is broad, and the opportunities many; and in neither one direction nor the other—manufacture or utilization—is hope confined to advance being limited to the improvement of what now exists. With accrued and accruing economy and efficiency, forward movement naturally becomes the more difficult. But upon the forward movement our "Register of Patents" tells us that a little army of workers are constantly labouring, and are ever alert. The past is full of encouragement for the present; and in the future, we doubt not, science and practical endeavour working in unity will yield an abundant progress in economical and efficient production and service, to the advantage of the industry at large and those it serves.

A Notable Presidential Address.

IT is with much satisfaction and pleasure that we call our readers' attention to a presidential address, the translation of the first portion of which will be found in another part of our present issue. Its author needs no introduction from us; for M. Emile Cornuault, as a French gas engineer and administrator, has achieved a high reputation which long ago crossed the Channel, as he himself also has frequently done. In this connection, it may not be without interest to record the fact that M. Cornuault has by no means confined his great abilities to gas affairs; for he is also a Director of the London General Omnibus Company. Having been President of the Société Technique de l'Industrie du Gaz in 1889, he is an honoured and honorary member of the Institution of Gas Engineers. His elevation, therefore, to the Presidential Chair of the leading Civil Engineering Society of France—the Société des Ingénieurs Civils—is a matter of congratulation not only to members of that prosperous

institution, nor only to our colleagues of the French Gas Society, but also to us in England. In thus conferring upon M. Cornuault the highest honour that French civil engineers can bestow, they have thereby conferred a mark of distinction upon the gas industry as a whole. Our warmest congratulations are offered to the gas engineer who is the present President of the Société des Ingénieurs Civils de France; and we shall hope some day to see the example of the French Institution of Civil Engineers emulated by our own Institution in London.

M. Cornuault's address was delivered on the 4th inst., at the home of the Society in the Rue Blanche, Paris, where the French gas meetings have also been frequently held. Almost needless to say, the presidential discourse took the form of a chronological and historical account of gas lighting; and the wonderful story of its development and progress was admirably unfolded before his audience of civil engineers of all branches, who loudly applauded its delivery. The constructional and manufacturing sides of the gas industry were not dealt with; illumination, and chiefly public illumination, being the main topic. M. Cornuault approaches the subject naturally enough from the French point of view, though his outlook, as will be gathered from what we have already said of his distinguished career, is by no means a one-country or a one-sided vision. This is distinctly shown in the latter part of his address, where he records the gas consumption of towns in eight foreign countries; and also in the broad and impartial way in which he refers to the competition of the electric light. As a gas-lighting advocate, he is by no means afraid of this, or any, competitor; and he gives ample figures to support the faith that is in him. Thus, in Paris the gas consumption during the last ten years—notwithstanding electrical and other competition—has increased by 30 per cent., from 270 million cubic metres in 1897 to 350 millions last year. Such increases—we know and M. Cornuault well shows—are not confined to any one town or to any one country. As is said of Science, so may it with equal truth be said of gas progress—it knows no nationality and has no frontiers. Figures of representative towns in half-a-dozen different European countries quoted by the President, show that, in the last decade, their total consumption of gas has gone up by no less than 80 per cent. Some individual cases are, of course, much higher even than this—the highest being 136 per cent. increase at Basle. To show, also, the great development that has taken place in the use of gas for heating in addition to lighting, two towns are chosen because of their being so well equipped with the electric light. The actual figures year by year are given from 1896 to 1905; and in one case, the gas for lighting has increased in that period by 18 per cent., while the augmentation due to gas for heating is 142 per cent. In the other and smaller town chosen, the corresponding percentages of increase are 60 and 570. Truly, only the fringe of the field for gas extension has hitherto been touched.

The first public gas lighting was done in Paris in the Place du Carrousel on Jan. 1, 1829; so that we in England, however much the claims of Murdoch to be regarded as the inventor of gas lighting are disputed, have the satisfaction of anteceding this date by fifteen years. Westminster Bridge was lighted by gas-burners on Dec. 31, 1813; and the parish of St. Margaret's, Westminster, on April 1, 1814. It may be true of France that, as M. Cornuault says, "it "was only after 1830 that lighting by gas practically estab- "lished itself;" but its practical advent in this country was certainly much earlier than that. We should have been glad if the President's interesting and concise summary of the characteristic periods of lighting had been extended from 1880 to the end of the last century, instead of leaving off at the former date. We should also have liked to have been told some more about high-pressure lighting. But it seems ungracious to ask for more where so much has already been given us. We can strongly recommend to the notice of students M. Cornuault's clear, historical account of the progressive stages of gas-burners. They will there see how the French standard of light, the carcel, was first obtained by consuming 130 litres of gas in a flat-flame burner; then by 70 litres in a regenerative burner; next by 20 litres in an ordinary incandescent burner; and now even by 10 litres in an improved one. Thus by successive minds, by plodding workers, and by painstaking experimenters, has the efficiency of coal gas been increased over tenfold. The lesson is that there is no such thing as finality in human effort and human progress; and we in the gas industry may all still play our part in the triumph of it.

London's Expenses in Fighting for Liberty for Gas.

By returns that were issued by the Local Government Board last week, the ratepayers of London had light thrown upon the enormous spendings of the London County Council and the Borough Councils in promoting and opposing Bills in Parliament. The activity of the County Council since their work came under the domination of the Progressive Party, and more especially their meddlesomeness with all forms of private enterprise, have become notorious; and it is a reproach to our methods of local government that such outrageous waste as is shown by these returns to have taken place should be possible. There is no restraint whatever, so far as the County Council are concerned. They are, in fact, a law to themselves in this matter. A mere vote of their own, without any reference to the ratepayers, will carry them into Parliament to attack or to be attacked, regardless of expense. In the four sessions from 1903 to 1906 (part of the costs are estimated so far as the latter session is concerned), the ratepayers of London now learn that the Council have indulged in some good, but mostly speculative or useless, work in Parliament at a total cost of £101,032, made up of £67,966 spent in promotions, and £33,066 in oppositions. A large number of the Bills promoted have been rejected by Parliament, or have had to be withdrawn; and the advantage achieved by opposition has had a diminutive appearance in contrast to the cost. The return relating to the Borough Councils cover a longer period by two sessions; and in that time they have managed to spend £71,933 (£62,089 having been in oppositions), which, added to the County Council's £101,032, makes a grand total of £172,965. This is an enormous sum for the ratepayers to have had to pay in such a short period for parliamentary expenses. The portion of the amount that has been wasted is in a small degree perhaps a result of the divided administration to which London is exposed; but in larger degree it is due to the gorgeous ideas of our Metropolitan rulers. With those ideas the grand total above mentioned has a commensurateness which perhaps (if we could only see the matter in the light of progressivism) is right and proper, though submitted to the judgment of our own intelligence, it appears to be somewhat appalling. Only those who are engaged professionally in Private Bill work—the lawyers, agents, and expert witnesses—who reap from this wild sowing can raise their voices in joyfulness.

The period covered by these returns is that during which the London Gas Companies and the South Suburban Gas Company have been fighting for greater liberty for themselves and for the gas industry at large; and it is found that the price that has had to be paid to carry the fight to a successful issue has been a heavy one, and all through the frantic efforts of the County Council and the Borough Councils to neutralize the action taken to obtain the countenance of Parliament to changes to assist the natural advance of the industry. The County Council and the Borough Councils blocked the way of progress—successfully for a time, but right and commonsense eventually prevailed. The ratepayers and the gas consumers, however, have had to foot the bill representing the parliamentary operations against the Companies. For the ratepayers and consumers, the money so spent, in the result, has been so much money destroyed; and the total is anything but an insignificant one. The County Council's expenses during the past four sessions in promoting three Gas Bills and in opposing eleven Bills promoted by Gas Companies have amounted to £5297, of which £2330 was spent on promotions, and £2967 on the hostile expeditions against the Companies. In a note to the London Gas Bill of 1905, which the Council promoted, it is said that "the Bill became law." But it is not said that the Bill that "became law" was not the Bill as introduced by the Council. However, that is now a matter of history; and our present object is the exposure of the waste there has been of public moneys and the loss to the ratepayers and consumers in what has been, if the position of 1903 is compared with the situation in 1907, purely abortive opposition. For what was sought a few years ago is what obtains now, with slight modifications.

Examining the return relating to the Metropolitan Borough Councils, the expenses of opposing the Bills of the London Gas Companies and of the South Suburban Gas Company since 1901 amount to a total of £2393. So that the County Council since 1903 and the Borough Councils since 1901 expended between them £7691 in connection with gas legislation. Over the persistent, and ultimately

victorious, efforts of the South Suburban Company, the Borough Councils (chiefly the Lewisham district authority) since 1903 have spent the sum of £864, and the London County Council £1798, or together £2662; and we know that the Company, in the four sessions' campaign, were involved in an outlay of something like £10,000. It may therefore be said that the struggle for greater freedom on the part of that one Company cost the ratepayers and consumers, in round figures, £13,000. But that is not the whole of the tale. A computation that we have made of the parliamentary expenditure of the three London Companies during the three-and-a-half years ending June 30 last, shows that it amounted to £25,000, or thereabouts. A small part of this was no doubt spent in protecting the Companies' interests in other ways; but the bulk of it was expended over those matters that have been projected so prominently into the recent history of the gas industry. Adding together the £25,000 spent by the London Companies, the £10,000 spent by the South Suburban Company, and the £7691 spent by the County Council and the Borough Authorities, we have a total of £42,696, which may be taken to be a very fair indication of the price that has been paid in London, in the past four years, in successfully carrying through the struggle for the greater freedom that is now enjoyed by the gas industry. And to this ought to be added the large amount of money spent, preceding the period covered by these big figures, by the South Metropolitan and Commercial Companies, in breaking down the 16-candle power gas standard for London, together with the sum expended by the London County Council in obstruction. The South Metropolitan Company alone in 1900—the year of their 14-candle power Gas Bill—expended on parliamentary work between £8000 and £9000. What was then accomplished has resulted in the adoption of a 14-candle power gas standard in the model clauses. Then there was also the expenditure of the Companies in protecting the industry against the application of portable photometry at the instance of the London County Council.

The industry will most jealously guard the gains and the restoration of just conditions that have been so dearly won; and there will be no thanks to those who would in any way attempt to betray the interests of the industry. A great victory does not always result in an immediate state of single-mindedness between the victors and the vanquished; and there are bound to be petty outbursts before all antagonism dies out. The reference to the Board of Trade of the dispute between Southport and Birkdale as to the adoption by the former of the Metropolitan argand burner No. 2 (as reported last week) is a little outbreak of opposition to a fair and equitable method of testing gas of all illuminating qualities within range of English statutory standards. There has never been a test-burner before this that was capable of doing justice to gas of all qualities. Such a test-burner has been a desideratum; with it in actual possession, it is so no longer. For lack of any better argument, it is contended that the burner does not act fairly towards the user of flat-flame burners. The user of flat-flame burners has a short road, through the incandescent burner, of obtaining an adjustment with interest of any loss he is supposed to suffer, by securing a greater duty from his gas than he has ever obtained before. Those who oppose the new test-burner on such grounds are engaged in the quixotic task of essaying to protect the indolent and the laggard. For the sake of such, the industry does not intend to be held back; nor must the prudent gas consumer be made to suffer for the imprudent. What the London Companies have gained for the industry by incessant toil and a no mean expenditure of money, time, and labour, must redound, as the effects accrue, to the common advantage of the gas consumers and the industry.

Construction and Lighting of Purifier-Houses.

The explosion in the purifier-house at the Brunswick Street works of the Alliance and Dublin Consumers' Gas Company has been the subject of inquiry by the City Coroner, owing to one of the victims having succumbed to his injuries. Much as even the loss of a single life is to be deplored, it is highly gratifying, in view of the number of men working in the house at the time of the accident, that we have not to chronicle a greater destruction of life. For the Chairman (Alderman W. F. Cotton, J.P.), his colleagues, and the officials of the Company, it will always be a matter of thankfulness that, in the construction of this house, everything to the best of knowledge prior to the accident had been done to ensure safety. It was not an enclosed house; being open on all sides but one. The purifiers, too, were raised 16 feet from the ground, and they are not roofed over. Had it been an enclosed building, there can be no doubt that the sacrifice of human life would have ranked among the greatest in the history of gas-works operation. According to a statement at the inquest by Mr. John Jackson, one of the Inspectors of Factories, the Home Office has recently drawn the attention of the Inspectors to the question of the conditions of purifier-houses—no doubt particularly as the result of the lamentable explosions at Saltley and Coventry, in both of which cases the purifiers were in enclosed—of course, ventilated—houses. It is satisfactory to know, Mr. Jackson was able to testify, that the house at Dublin largely complies with the recommendations of the Home Office. It also transpired, from Mr. Jackson's observations, that the Home Office has directed that portable, self-contained electric lamps should be used in purifier-houses, in place of the old-fashioned hand lamps.

This touches upon the cause of the ignition of the gas in the Dublin purifier-house. It is a matter upon which no one can speak positively; but there seems room for very little doubt that, as was suggested in an editorial reference to the subject last week, the fusing of an electric wire introduced all that was needed to produce the explosion of a temporary accumulation of gas under the purifiers. The Company's Chief Engineer (Mr. W. F. Cotton, jun.) suggested as a possible alternative—although not disputing that a defective electric wire might have been the cause—that a hopper-door under the purifier upon which work was proceeding, by striking the bottom of the box on being smartly opened, might throw off a spark sufficient to ignite gas. Against this theory, is the testimony of Mr. Waterfield (the Assistant Engineer) that shortly before the explosion he was under the purifier, and all was right then (in the report, however, it does not state whether this was before the opening of the hopper-doors), there is the evidence as to the electric wire being stripped and its fusion, and there is Mr. Jackson's opinion that an electric wire was the cause of the accident. In this case one of the wires passed between the two hopper-doors under the centre of the box where the explosion took place. This testimony all tends to support the contention of last week (and in the interests of future safety elsewhere, it must not be regarded lightly) that, in the rough work of a purifier-house, flexible and exposed electric wires are not desirable, and that where incandescent electric lamps are applied (as in this instance) for safety, the lamps should be fixed and wires and bulbs be properly protected. For the use of the men where they require a light closer to the work on which they are engaged than is afforded by the fixed lights, a portable electric lamp, with dry battery, is preferable. The Company, it is understood—and this is further evidence of their belief in the guiltiness of the fused electric wire—are going to substitute for the wired lamps that the men have been using, portable self-contained hand lamps. In many gas-works in the country, electric lighting is the vogue on the score of safety, in those buildings where, accidentally, explosive mixtures may be formed. To the engineers of such works, this accident will be suggestive, and where necessary, precautions will accordingly be taken.

The Presidency of the Midland Association.

The annual meeting of the Midland Association will be held on Thursday, Feb. 28; but the members will not have the felicity they have been contemplating of welcoming to the chair the President of their choice for the ensuing year—Mr. J. H. Brown, of Nottingham. Confirmation of the resignation of Mr. Brown of the presidency—a step that was foreshadowed in our news columns on the 1st inst.—has been received from the Hon. Secretary of the Association (Mr. Charles Meiklejohn, of Rugby); and the further information is afforded that, on the unanimous wish of the Committee, Mr. Hubert Pooley, of Stafford, has kindly consented to at once proceed to the presidential chair, and Mr. Harold E. Copp, of West Bromwich, to the vice-presidency. The paragraph in the "Journal" on Jan. 1 indicated generally the causes that have led to Mr. Brown relinquishing the office, the acceptance of which was with the full concurrence of the former Corporation Gas Committee. The Association Committee realize that, under the circumstances in which their late President was placed by an ungenerous section of the Committee now

in charge of the Nottingham Corporation Gas Department, Mr. Brown could not have taken, on his own behalf and on that of the Association, a more dignified course. Naturally the Committee of the Association and the members generally will regret that Nottingham should happen to possess the one example of a Corporation Gas Committee some of the members of which—through we presume stubborn ignorance—fail to appreciate the value of the work of technical organizations. Such ignorance will withdraw from the Nottingham Committee the respect of all intelligent men in the gas industry. A greater regret to the members of the Association than the loss of a visit to Nottingham, will be that of the loss of Mr. Brown at the head of affairs in the coming year; but of this we may be sure, that with the regret is mingled the complete sympathy of the membsrs. This incident has not done anything to mitigate the unpleasant aspects of recent events in Nottingham; and the Gas Committee have certainly lost an opportunity of doing something towards retrieving lost honour.

The Lighting of Railway Premises.

Very good use was made by the speakers of the forty-five minutes, or thereabouts, that were allowed at Friday's meeting of the Institution of Mechanical Engineers for the completion of the discussion of Mr. Henry Fowler's paper, on the "Lighting of Railway Premises," which was adjourned at the December meeting. Last month, Mr. Fowler's paper was preceded by the conclusion of the discussion of a communication on an altogether different subject; and on Friday there was a long paper down on the *agenda* for submission to the members on the completion of the discussion on railway lighting. Whether or not there would have been further discussion of Mr. Fowler's paper had time permitted, it is impossible to say; but, at any rate, it may be remarked that those who did speak had not a very great deal to say in the way of adverse criticism of the author's contentions. Two gentlemen—Mr. A. P. Trotter and Mr. Henry Lea—described portable photometers that they have arranged for their own use, and which are claimed to satisfactorily answer the purpose for which they are intended. Then Mr. J. E. Evered drew attention to a large installation of Kitson lamps in operation at Sunderland Station; while Mr. Mackworth Praed described, with the aid of a working plant, an invention for carburetting air with petrol. Numerous other lighting systems and appliances were also referred to. There was some diversity of opinion as to the exact position at which the illumination of a room should be measured—Mr. Lea favouring 3 feet from the ground, Mr. F. W. Goodenough 4 feet, and Mr. Fowler himself 9 inches. Among the other interesting facts elicited during the discussion, was the very small number of fires following on train wrecks that have been traceable to the gas used for lighting the carriages. The President pointed out that this did not strictly come within the scope of the discussion; but Mr. Hughes was allowed to make his statement, which was to the effect that the records of the past 26 years showed that the fires caused by gas amounted to only 0·27 per cent. of the total number of accidents. This fact, he said, should re-assure the British travelling public. Mr. Hughes protested against the prejudicing, in this connection, of such a valuable lighting agent as gas; and we must point out that the same position was taken in an article on the subject which appeared in the "JOURNAL" a few weeks ago.

London Junior Gas Association.

The London and Southern District Junior Association are certainly to be congratulated on the work they have so far accomplished during the present session. The greatly improved attendances at the meetings have naturally resulted in the papers submitted being animatedly discussed, which is, of course, both encouraging to the authors and beneficial to the members. The two visits that have been carried out were also very largely taken advantage of, as, indeed, is not to be wondered at in view of their interesting character. In point of comfort, too, the new meeting-place is everything that can be desired; so that altogether one cannot but feel that the gatherings have been rendered as attractive as possible. Under these circumstances, it would not be surprising if we had the pleasure of recording still larger attendances at the meetings as time goes on. Last Wednesday, the Association were able to make what was for them a new departure; Mr. W. H. Y. Webber having consented to deliver a lecture on "Flame Temperature in Its Physical Aspects." This was accompanied by demonstrations with various kinds of burners: and it was followed with great attention by an audience which numbered about fifty. At its close, various points were discussed, and a number of questions were asked. An interesting feature of the lecture (an abstract of which will be found in to-day's issue) was a series of comparative observations—made by Mr. A. W. Onslow, by means of the Féry pyrometer—of the radiant temperature of incandescent mantles.

An Employers' Strike Fund.

Some months ago, reference was made in the "JOURNAL" to a proposal which had been put forward by Sir John Bingham to the effect that British manufacturers should provide a guarantee fund for the purpose of combating strikes forced upon them by Trade Unions. We learn from the "Standard" (in whose columns the proposal was first made) that there is a strong probability of the suggestion taking concrete shape in the near future. Sir John Bingham himself offered to guarantee £10,000 for such an object; and it is understood that other leading firms have expressed their willingness to become responsible for equally large sums to a properly constituted fund. Indeed, our contemporary says, the proposal seems to be regarded with so much favour that it is considered probable that there will be little difficulty in establishing a fund of from £10,000,000 to £20,000,000. It should be pointed out that the main object in view is a purely defensive one; being no more and no less than to do for the employer what the Trade Unions have already accomplished for the workers—that is, provide effective means for the protection of his interests. The very fact that the idea was mooted by Sir John Bingham should be sufficient to prove this, inasmuch as he maintains the most cordial relations with his own many employees. His contention is that a masters' strike fund would in reality be to the ultimate benefit of the workers, inasmuch as it would induce Trade Unions to exhaust every means of conciliation before entering upon an industrial struggle. There would appear to be reason in this argument; for it is on the lines of the widely accepted maxim that the best method of ensuring peace is to be prepared for war. It should not be difficult to draw up an agreement between the subscribers which would prevent any possibility of the fund being used for purposes of oppression—in fact, Sir John Bingham himself suggested the conditions which might be imposed when he originated his proposal. It is stated that the advisability of creating such a fund as is here alluded to is being keenly discussed in Australia, New Zealand, and the United States.

The Seventh Annual Dinner of the Manchester and District Junior Gas Association will be held in Manchester next Saturday, and will be followed by a smoking concert.

More "Wit."—The electric light and its vagaries attract unwelcome attention at times in the columns of the daily papers. Recently, the "Tribune" wrote: The arc lamp which played "God Save the King" at the Royal Institution the other day has roused to speech a number of indignant grumblers in the West End, where electric lighting of late has been playing hide-and-seek. They ask what on earth is the use of teaching lamps these fancy accomplishments when they cannot even perform their ordinary domestic duties. If there must be music, let it, at any rate, be light opera.

Water-Gas Tar for Roads.—At the second congress on Improved Sanitary Dwellings held at Geneva last year, after such questions as sanitation, water supply, heating, and lighting had been dealt with, the development of modern methods of locomotion and the part to be played by hygienists in connection therewith came up for discussion. It was recognized that the dust caused by motor-cars must be overcome, and several tests on road-tarring had been carried out. M. Navazza, the President of a Swiss league dealing with this matter, made an interesting report. He pointed out that in the United States heavy oils had been successfully used, which were five or six times cheaper there than in Europe. In Geneva, Lambercier asphalte had been adopted, the application of which cost from 14 c. to 15 c. per square metre (about 1s. 11d. per square yard). It was put on either hot or cold; equally good results being obtained in either case. The oil coating of roads had also been tried, and had given encouraging results, especially for temporarily suppressing dust for particular events. But undoubtedly the best results were obtained with coal tar, as practically applied in France. In Geneva, the residual tar from Messrs. Humphreys and Glasgow's system of carburetted water-gas plant had been successfully used. It cost 30 frs a ton, and 1·5 kilos. of it were required per square metre, or 2·76 lbs. per square yard. M. Navazza considered it was necessary to tar all stone or macadam roads in the vicinity of towns, especially the routes most used by motorists.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 233.)

Last week was account week on the Stock Exchange; and the prospect of lighter carrying-over rates promoted a tone of cheerfulness on the opening day. This condition prevailed through the next day. Business, however, fell very quiet; and there was little heart in it. Wednesday found dulness creeping over the markets, which not even the assured expectation of a fall in the Bank rate the next day could dissipate. The expected reduction in the rate duly became an accomplished fact; but it seemed to have little effect beyond giving something of a fillip to investment business. Things only became worse on Friday; and on Saturday they were decidedly flat—influenced considerably by the American Market, a quarter which requires careful watching for the appearance of a danger signal. In the Money Market, there was a good demand, which the supply was adequate to meet, and rates were easier. But after Thursday—when the 6 per cent. Bank of England rate (which had lasted just three months) was reduced to 5 per cent.—there was a very perceptible hardening. Business in the Gas Market was fair, although scarcely as brisk as during the week before; and the tendency was favourable. Stocks in general were firm, coupled with a nice rise here and there. Dividend announcements are now in season; and that issued by the Gaslight and Coke Company was received with satisfaction. The Company can maintain their usual rate of dividend, and carry forward a balance higher by more than £48,000 than they did this time last year. Aided by this prospect, the ordinary stock pushed its way steadily from 99¾—the opening price—up to 101, at which figure several transactions took place; and the quotation was finally marked one point up. Among the secured issues, the maximum (which partakes of the sliding-scale in a limited degree) was strong and active—changing hands at from 89½ to 90½, or a rise of one in the quotation. The preference was done at 107½ and 108¼; and the debenture at from 85 to 86. South Metropolitan was more active than it has lately been; and prices were unchanged. Transactions ranged between 128 and 129½. The debenture was active—marking from 85¾ to 86½ *cum div.*, and from 85 to 85¾ *ex div.* Commercials were again very quiet, with two or three bargains in the 4 per cent. at 112¼ and 112½. Among the Suburban and Provincial group, Bournemouth was done at 29, Brentford old rose 2, Brighton original marked 234½—a rise of 2. British was done at 43, Lea Bridge at 122½, South Suburban at 124¼ and 124¾, and West Ham at 104. There was less doing in the Continental Companies. Imperial advanced ½, with business marked at from 179 to 180. Union changed hands at 126¼; but European was not dealt in. Malta was done at 4½ and 4 9/16. Among the undertakings of the remoter world, Bombay part-paid was done at 5⅛ and 5¼, Buenos Ayres at 11¾ and 11⅝ free, ditto debenture at 95½, Cape Town at 14, Monte Video at 12, Primitiva at from 7¾ to 8 1/16 (a rise of ¼), ditto preference at 5 7/16 and 5 11/32, ditto debenture at 95, and River Plate at 12⅝ and 12 7/16.

The closing prices are shown in our Stock and Share List on p. 233.

ELECTRIC LIGHTING MEMORANDA.

Mr. Swinburne Explores the Metallic Filaments—The Testing and Standardization of Carbon Filament Lamps—Danger in Oxford Street—An Irate Bulletin Editor—Advice from a Contemporary.

The past fortnight has been one in which the incandescent electric lamp has been thrust into great prominence; but the net result is not overpowering. On the 10th inst., there was a large muster of members at the meeting of the Institution of Electrical Engineers seeking hope from the lips of Mr. James Swinburne, and he (to use a commonplace), through circumstances over which he has no control, sent them away as empty as they came. He talked of the new incandescent electric lamps—that is to say, of those of the metallic filament type; and the best he could do for the seekers was to offer them a cold collation of common knowledge and truth, with an amount of personal opinion and humour sprinkled about it, to give it a little flavour. For this country, under the almost general system of electricity distribution at 200 to 250 volts, the problem that has to be faced is the making of metallic filaments sufficiently fine to enable lamps of the newer type to be used with such pressures, notwithstanding the low specific resistance. The newer lamps are all made, through physical limitations, for low voltages; and people in this country are not likely to use them in series to any great extent, or to accommodate the pressures to them. Mr. Swinburne seems to think that people's ideas of the value of light will alter, and that incandescent gas-lamps or large metallic filament lamps will soon lead them to use 50 candles as the normal light at each point. But the perfect metallic filament lamp of 50-candle power that can be used under all conditions has yet to be found. What, however, users of incandescent electric lamps are clamouring for, is not only improved and constant light, but a reduction of their lighting bills. The adoption of 50-candle power lights at one point with electricity would confine users to the high consumption and, so far as can at present be seen, perpetuate their heavy accounts. With electricity, they have not the power that the gas-tap gives them, of diminishing or increasing consumption and light at will within the limits set by the burner employed. The low power carbon filament lamps give consumers somewhat similar control by reducing or increasing the number in use; but this could not be done without disastrous consequences with the new metallic filament lamps under the prevailing pressures, nor with units of 50-candle power. When flat-flame gas lighting was the vogue, complaint was rife as to the heaviness of accounts. The incandescent mantle gave relief from this, not only by producing greater efficiency, but by reducing cost. And electricity consumers hope to see history repeating itself; but it looks a forlorn hope. The Electrical Press appear to be unanimous in not agreeing with Mr. Swinburne's opinion that the consumer will pay no attention to cost, so long as he gets greater efficiency.

Mr. Swinburne summarizes the characteristics of all the metals known to have been tried in developing the new lamps; but melting-points and specific resistances set impregnable bounds to practicability in securing lamps that can be used independently, as the carbon filament lamp can be with voltages of 200 to 250. Mr. Swinburne discussed alloys; but alloys generally have low fusing points, though it may by further research be found possible to form alloys of high melting-points. Alloying, too, has a possible disadvantage in reducing the resistance-temperature coefficient, whereas rise in resistance is a most valuable property in a wire lamp, as it protects the lamp against over-running, and allows it to be run bright on a more variable supply current. Therefore some more information is wanted before it can be accepted that the 32-candle power Zircon-Wolfram lamp (to which the "Electrician" this week calls special attention) will render good service on circuits of 200 to 220 volts, seeing that it is believed to be made of an alloy of zirconium and tungsten. We may have an opportunity on another occasion of looking into other points of Mr. Swinburne's paper on the present unpromising situation of the metallic filaments. Generally, what he has been showing is that the new lamps are of little value for this country, but electricians are urged to go on expecting, for science cannot have yet exhausted itself in this direction. If hopefulness is not a strong feature of the paper which was prepared by this buoyant spirit of the electrical industry, it is not by any means devoid of interest for the gas industry.

So much for the metallic filament lamp. The carbon filament lamp has also raised its much-abused head during the past week. With all its faults, the electrical industry is perforce bound to love it still. The Engineering Standards Committee—after much weary waiting—have issued the specification for carbon filament lamps; but we are not sanguine that it will do much good. A standard specification is one thing; compliance with it is another. The rules and regulations, it is noticed in the first place, have a tender leaning towards the National Physical Laboratory; for it is provided that the "British light standard shall be the 10-candle power Harcourt pentane lamp at the National Physical Laboratory." Why the lamp at the National Physical Laboratory? The secret comes out when it is seen that it is from this example of the standard lamp that carbon filament "secondary standards" are to be obtained. So that the object is to give the establishment at Bushey business in the provision of secondary standards, and so introduce another opening for inexactitude in the ratings of electric lamps. In the gas industry, the 10-candle Harcourt pentane lamp finds place in all gas-works laboratories worthy the name; and direct tests are made of lights without the introduction of secondary lamps that cannot be checked without sending them away for the purpose. There is nothing in the lamp at Bushey that should make it superior to any other 10-candle pentane lamp. The National Physical Laboratory in this matter is, there is no doubt, doing its level-best to get the electrical industry under its wing for revenue purposes; but if a gas-works can afford to have a standard pentane lamp, and the manager and assistants all fully qualified to use it (photometry being part of their technical training), surely the manufacturers of incandescent electric lamps would do better by themselves dealing direct with the pentane lamp than by being dependent upon the National Physical Laboratory. There is nothing secret, terrible, or difficult about the standard pentane lamp that it should be necessary to make the distance between it and the markings on carbon filament lamp bulbs any greater than between the works' own laboratory and the shop where the inscriptions are made.

That is one point; the question as to the consumer procuring lamps of greater uniformity in performance and with the nominal valuations of lamps real and not fictitious is another. But who is to come to the aid of the consumer in this matter? It is all very well for the Standards Committee to say that the useful life of a lamp is completed when the mean horizontal candle power has dropped 20 per cent. But who is to stand over the consumer to tell him when his lamp has fallen the 20 per cent. in mean horizontal candle power? The prescriptions for the making of the lamps do not concern us; but the results do. In the prescribed tests, it is noticed that the "average" limits within which results may fall are 8 per cent. for the candle power, and 5 per cent. for the total watts; but individual lamps are allowed 60 per cent. greater latitude. These are fairly benevolent "average" limits. The life tests are also to be carried out on a circuit whose voltage is never more than ½ per cent. above normal; the pressure being adjusted at the start so that the lamp is burning at its standard efficiency. Those are not the same conditions as the irregular ones the consumer meets with; so that, except to enable him to start with lamps that are more consistent than those he buys

at present (that is, if he is certain of obtaining lamps that comply with the specifications), he will not realize much, if any, benefit from their use above what he obtains from the good class lamps at present. It is noted that, in a table of standard efficiencies, the watts consumed per hour per candle power per 8-candle power lamp, with a life of 400 hours and at 110 volts, are 3·25, and at 220 volts, 3·90 watts. For an 8-candle power lamp, with a life of 800 hours, and at 110 volts, 3·75 watts; at 220 volts, 4·50 watts. For a 16-candle power lamp, with a life of 400 hours and 110 volts, 3·10 watts; and at 220 volts, 3·70 watts. For a 16-candle power lamp, with a life of 800 hours, and at 110 volts, 3·50 watts; and at 220 volts, 4·10 watts. These are "standard" efficiencies, which will not be maintained in practice. But they show we have not in the past been acting unjustly in taking an average, under consumers' conditions, of 4 watts per hour per candle. It is easy to express agreement with the frank remarks on this subject of the "Electrical Review." "It is well known," says our contemporary, "that 220-volt lamps of 16-candle power, reputed 60-watt lamps, take anything from 70 watts upwards during *their brief lives;* and they *vary widely in candle-power.* Consumers are entirely at the mercy of dealers [our contemporary should have added "and central supply stations"], except in the rarest instances, and all sorts of abominations are supplied to them, whether in good faith or not is immaterial. . . . No wonder that consumers who are paying for 16 candles and receiving 8 are restive, and even rebellious, or that the gas interests are recovering lost ground."

No one will envy the Marylebone Borough Council the possession of their electricity undertaking. What with the enormous capital expenditure, the supply breakdowns, and the opposition the plans for the lighting of Oxford Street have evoked, existence must now for their Electricity Committee be almost unendurable. They would have had less occasion for worry if it had not been for those centrally placed lamp standards in Oxford Street. They are perfect *bêtes noires* to those who have at heart the interests of London traffic and the safety of the public. The London County Council have had a shot at them; and their action has the support of the report of the Royal Commission on London Traffic. Now it is the Roads Improvement Association who are attacking the Marylebone Borough Council on the same grounds. The obstruction caused by lamp standards down the middle of roadways has been recognized by other local authorities in London; and only recently the St. Pancras Borough Council have been, at considerable expense, removing those in the Marylebone Road. The Roads Association protest against the obstructions in Oxford Street, and against the danger that threatens the public by having the standards in such a situation. The Local Government Board have been appealed to; but they have replied that the matter is not one in which they have any authority enabling them to intervene. The Borough Council have now given the Gaslight and Coke Company notice to discontinue the gas lighting; and the business people of Oxford Street are beginning to realize that the danger of the centrally disposed standards will be vastly increased, when the gas-lights no longer exist, and when, without warning, the electric lights suddenly collapse at busy hours, as the interior ones have recently been doing. With the electric light aiding and sheltering by its vagaries, Oxford Street will become the resort of more undesirables than the shopkeepers there will care about. The "Lancet" has also been complaining of the seriousness of these failures from the point of view of the medical specialists and others in the Marylebone district.

The Editor of the West Ham Electrical Bulletin has been sorely hurt by our article on "Gas and Electricity *vis-à-vis* at the West Ham Town Hall," published on Nov. 27 last. He describes it as "a most abusive, unfair, and vulgar tirade against the West Ham Electricity Department," our methods are compared to those of "saffron journalism," and we are accused of "coarse abuse." Judging by the standard applied to our article, this writer surely could scarcely find language strong enough to describe these particular efforts of his own. We are not quite certain, however, that the Editor of the West Ham Electrical Bulletin, in his great wrath, quite knew, when writing his notes, the full import of the words he was using, nor did it apparently occur to him that he was exposing himself to the liability of having to seriously justify those words. If he has cooled down by this time, we will give him an opportunity of pointing out in the columns of the "JOURNAL" where the article in question (which was the result of a visit to the West Ham Town Hall) was "vulgar," contained "coarse" abuse, and savoured of "saffron journalism." There he has three distinct points on which to give explanation; and if he cannot make a satisfactory defence, perhaps he will ultimately come to the conclusion that argument and fair criticism in journalism—amateur or otherwise—are better than scattering about epithets that carry personal reflection. The Editor of the juvenile "Bulletin" can be a jocular fellow as well as an angry one; for he also protests against the "vilification of matters electrical." The humorous side of this is great when the contents of samples of earlier "Bulletins" that have reached us are remembered. There is little doubt that it is a good thing our reputation does not depend alone upon the estimation accorded to it by the person responsible for the paragraphs in question in the West Ham Bulletin. We await his justification. Meantime—in view of further reflections upon us in which Mr. Dugald Clerk's address, at the last meeting of the Society of British Gas Industries, was concerned—perhaps it will interest the writer to learn that a verbatim report of that address appeared in the same issue of the "JOURNAL" as the offending article. It is rather peculiar that this should have escaped his attention, and that the fairness of our report was not acknowledged by him. But perhaps the excuse must be made that vision is often obscured by anger.

Our weekly contemporary "Electrical Industries" in its last issue addresses a little gratuitous advice to us anent our attitude in connection with municipal trading in electricity. The gist of the advice is that we should keep silent on the subject; for the best way of killing municipal electricity supply is to let it pursue the present suicidal policy. The advice would be good if it were not that municipalities have the rates and the public lighting to fall back upon *ad lib.* to support and conceal their maladministration, as well as many opportunities for shifting responsibility on to other departments. Gas undertakings happen to be large ratepayers and competitors. Increasing rates affect them considerably; and rate-aided competition is not competition on level terms. Our contemporary states how perfectly willing it is that the "JOURNAL" should "assist" them in discouraging municipal electricity. We suppose that deep gratitude for this honour ought to be felt by us; but what our feelings are we will not divulge. Meanwhile we have an idea that this is a case in which discouragement by silence would be a painfully long business; and therefore any part that we can take in agitating for the proper and business-like conduct of municipal electricity undertakings will not be neglected.

LAMP TESTS FROM THE WESTMINSTER ELECTRICAL TESTING LABORATORY.

WE have received from Mr. Lancelot W. Wild, M.Inst.E.E., of the Westminster Electrical Testing Laboratory, three volumes whose diminutiveness cannot be regarded as in any way reflecting the amount of work that the compilation of the contents has involved. The contents comprise a very large series of tests on the illuminating power, consumption, and life of some of the principal makes of incandescent gas-burners and electric lamps, other than ordinary or flame arcs.

In a covering letter by Mr. Wild, he says that "the tests fulfil two useful purposes. They show first of all the relative merits of different makes of lamp, whether gas or electric; and they also serve as a true basis for the calculations of the respective costs of gas and electric lighting." A criticism of the volumes is shorn of some of its effectiveness as we are prohibited from making use of the figures exhibiting the results of the tests. But so far as the results of the tests of the incandescent gas-burners and mantles are concerned, we must join issue with Mr. Wild in regard to any useful purpose whatever being fulfilled by them. In the first place, in considering the relative value of tests of this description—whether of gas or electric lamps—it must be remembered that, in laboratory tests, the conditions of common use in the best manner available to consumers are never or rarely ever reproduced, so that for cost comparison the results are really of little value. In these particular tests, too, the electrical lamps appear to have received all the refinement that a well-equipped electrical laboratory could possibly offer; while the gas-burners were not treated with the slight courtesy that they demand to produce the most valuable return in service. In the second place, tests made with the gas supplied by the Gaslight and Coke Company can be of very little value, for comparative purposes, in districts where gas of other qualities is distributed, under probably different pressures, and without carburetted water gas, or with carburetted water gas in differing proportion and richness. The tests of the gas burners and mantles as made by Mr. Wild can only have an academic interest, more especially as there is nothing to satisfy, but plenty having an opposite suggestiveness, that they were not carried out in a most crude and unscientific manner. The tests ranged over 500 hours, during the whole of which time the gas consumption remained constant for each individual burner; and, as nothing is said to the contrary, we may assume the air supply to the burners remained constant. A more unjust condition in connection with any bunsen burner used for incandescent purposes could not obtain. The composition and pressure of the gas may vary several times during a run of 500 hours; and the condition of the burner itself changes.

Therefore, to get the best results from the burners, both the gas and air supply require occasional adjustment. It is the practice of the consumer, each time he lights his burner, to turn his tap until he gets what he judges to be the maximum illumination from the burner; and it has also become the common practice of the consumer to use the means of air regulation now provided with all burners worth consideration. There we have, in daily use, adjustment of the gas and primary air supplies. By limiting the burner to constant conditions of use, it is impossible to do it justice or get an approximately uniform illumination; and this elementary fact the ordinary gas consumer appears to appreciate better than the testers at the Westminster Electrical Laboratory. Again, we are told that the chimneys were not cleaned during the period of the tests—lasting 500 hours! We cannot see the reason for this. It is the misfortune of the incandescent electric lamp that the consumer cannot clean the inside of the lamp bulb; but no gas consumer would permit—if he has any regard for cleanliness, or for maintaining the constancy of his lights—his lamp glasses to get into,

or remain in, a dirty condition. Then, again, we read that the nipples of the burners were cleaned repeatedly; but the experimenters say nothing whatever about the removal of the mantle and the cleaning of the gauze cap from dust. Truly more science is brought to bear by the ordinary consumer in dealing with his gas-lights than was exercised by the electrical photometrists at the Westminster Testing Laboratory in carrying out these tests. It is one of the great advantages of the incandescent gas-burner that it puts into the hands of the consumer conveniences for ready adjustment and cleaning, such as the electricity consumer does not possess, for the maintenance of constancy of light. And in any scientific tests therefore, no one but a tyro in gas-burner testing would surely refuse to give the burners the benefit of any superiority in respect of means for light maintenance.

With these preliminary objections, let us turn to the tables of figures; but we are cut short by the prohibition as to quotation. The figures show the total candle power, the consumption (constant, be it repeated, for each individual burner throughout 500 hours), and the illuminating power per cubic foot. In this connection, it will interest readers to know that the candle power was measured by a Wild flicker photometer; an electric lamp being employed as a comparative sub-standard. The comparison lamp was on each occasion checked against a Wild-Stearn standard incandescent lamp. The standard lamp was also checked against eleven other standard lamps at the commencement and on completion of the tests. So that the Westminster Electrical Testing Laboratory employs means of conducting tests that are peculiar to itself, and are not comparable with the statutorily prescribed and recognized appliances and methods of the gas industry. Without procuring the same photometrical paraphernalia as used at the laboratory, no one could ascertain how the types of burners and mantles used, tested under his own conditions, would compare with the really peculiar results shown in the figures in the tables. It will further interest men acquainted with photometrical work on incandescent gas-burners, to see that these tests ascribe to a Welsbach-Kern burner at the start a lower efficiency per cubic foot of the 16-candle gas of the Gaslight and Coke Company than was obtained from an ordinary Welsbach "C" burner. The strange manner in which the candle power per cubic foot of gas consumed widely varies with the same burners and the same types of mantles ought to have shown the observers that there must be something wrong in their treatment of the individual subjects under examination. Had the figures been even superior to those that we think ought to have been realized, and had the extraordinary discordance shown by these figures obtained with the same make of burners and mantles, we should still have rejected them as being unworthy of credence and acceptance. The names of the burners and the mantles are given at the top of each table; and we are afraid that when the tables get into circulation, the makers of some of the burners will, notwithstanding that the books are marked "Private and Confidential," be calling upon the Westminster Electrical Testing Laboratory to substantiate the figured assertions, which are, in most if not all cases, totally opposed to all preceding work in the same direction. The light tests for constancy are vitiated by unfair—"unfair" because it is not the common—treatment, and possibly also by the instruments and methods employed, supplemented (we will not say it is so, but will again say possibly) by a little natural favourable inclination towards those things that are electrical. In making this remark, we do not impeach the honesty of those who carried out the tests; but we do say the results of those tests are, on the face of them, disentitled to respect. Of course, incandescent gas-lights will show a gradual depreciation in illuminating power in 500 hours if they are not given occasional attention; and therefore, under negligent conditions, what is the good of the mean candle powers of all mantles throughout 500 hours? We can get higher mean illuminating powers by the exercise of the advantage of regulation that the incandescent burner gives us. Therefore it is impossible to endorse Mr. Wild's opinion that such figures as he presents are the "true basis of comparison between the rival makes of lamp, burner, or mantle."

The second volume comprises tests carried out on 200 volt, ½ and ¼ ampere Nernst lamps, 100 volt Tantalum lamps, and 100 volt, thirty watt Osram lamps. The third volume includes tests carried out on twelve different makes of carbon filament lamp.

We have already acknowledged the vast amount of work represented by these three small volumes. Measured by the time expended on the work, the volumes are well worth the three guineas (or 21s. for each volume) asked for them; measured by the value to the purchasers, if the desire is to compare between gas and electric lighting, we should certainly say the volumes are not worth the price asked. Independent tests made under normal conditions are of value; but such independent tests must give to the burners the best that can be obtained from them, by treating them as they are made to be treated, and by avoiding such crudity as we have pointed out. One commendation for the volumes is that they are neatly bound in leather, and are supplied with a protecting case. It is a question whether there has not been a little extravagance in putting the results of the gas-burner tests in such rich dress, for the binding is certainly the best part of that particular volume.

Mr. G. Shepherd, J.P., of Bacup, who was Chairman of the Rossendale Union Gas Company, left estate of the gross value of £170,963.

SOCIÉTÉ DES INGÉNIEURS CIVILS DE FRANCE

Presidential Address of M. Emile Cornuault.

We heartily congratulate M. Cornuault upon the distinction that has just been conferred upon him—and through him upon the gas industry—by electing him President for this year of the French Society of Civil Engineers. We do not remember that such an honour has ever previously been bestowed by civil engineers, either in England or in France, on an engineer who has devoted himself to the gas profession. We therefore rejoice that at last a representative Society of Civil Engineers has selected a gas engineer to occupy its presidential chair. No better selection could have been made than that which the French Institution of Civil Engineers has made; for M. Emile Cornuault has long been prominently connected with the Society, and as a gas administrator has achieved a reputation beyond the borders of his own country. In gas circles in England, he has reason to be particularly well known, for many and oft have been his professional visits to this country; and he has given especial attention to the gas affairs of London. In 1883, M. Cornuault contributed a paper on "The Gas Companies of London," both to the Société des Ingénieurs Civils and to the Société Technique du Gaz, who met that year at Marseilles. On the happy occasion of members of the latter Society visiting us at Brighton and in London in July, 1901, just after their annual congress at Dieppe, an abbreviated and amended reproduction of this paper was distributed, and proved of great interest and value to our visitors in understanding the gas affairs of the Metropolis. In the absence of that year's President of the Société Technique, it was fortunate that M. Cornuault was available to take the lead in representing his Society over here; and how well he did it, at Brighton, Earl's Court, Greenwich, and elsewhere, will be remembered by all present on those occasions, and as to which the columns of the "Journal" at the time afford every evidence.

M. Cornuault commenced his gas career with the Marseilles gas undertaking, rising to become the Manager, and later on the Managing-Director. Elected a member of the Société Technique du Gaz in 1874, he afterwards became the Secretary, then Vice-President, and President in the year 1889. This was the year of the Paris Exhibition; and it fell to M. Cornuault to welcome the English gas representatives, prominent among whom was Mr. Charles Hunt, who is once again the head of the English Gas Institution. M. Cornuault has also taken an active part in, and has been President of, the Syndicat Professionel de l'Industrie du Gaz, which looks after questions relating to the gas industry, but not of a scientific or a technical character. He has done a great deal of work at various times in connection with Parisian gas questions, and has received the Légion d'honneur for "exceptional services rendered to the City of Paris." Some of these facts and qualifications were pointed out by the retiring President of the Société des Ingénieurs Civils (M. Hillairet), when inducting M. Cornuault to the presidential chair at the Society's meeting on the 4th inst.

The Presidential Address.

The new President, in his opening remarks, gracefully alluded to M. Hillairet as "a man universally appreciated in the engineering world," and paid a high tribute to his work and character. Proceeding, he said it was chance rather than malice, that had led to a gas engineer being chosen to succeed an electrician in the post of President; and if it was intended by their two names to symbolize the union of the two industries, which were formerly rivals, they had been successful, for never had there been a more sympathetic collaboration than had united the President and the Vice-President, the predecessor and the successor.

Artificial Illumination before Gas.

Lighting was of interest to all mankind. When the sun dropped behind the horizon, civilized man, so as to replace daylight and extend the conditions of social life, had recourse to artificial illuminants, the number and power of which were to-day continually increasing. In fact, no limit could be assigned to them other than the clearness of day itself, though that limit was sufficiently far off if, as in the old works of Bouguer and the more recent calculations of Fontaine, it was reckoned that the amount of sunlight in a city like Paris, for instance, represented more than 10,000 times the whole artificial lighting now used in the French Capital. It might therefore be truly said that the scope of lighting is indefinite. Also it may be said that lighting is essentially modern. From the most remote times up to nearly the end of the eighteenth century, there was not any progress to speak of from one century to the other, although artificial illumination seems to be contemporaneous with human existence. From the beginning, men sought to prolong their labours beyond the time afforded them by the light of the sun; and without doubt, wood fires formed the first method of dissipating darkness. From this, one passed to the resinous wood torch, then to the Roman lamp, formed of a vessel pierced with a hole through which the wick plunged into the oil; and so to the wax candle, which was the luxurious light of the Romans. Later on came the candle, properly so-called, the tallow candle, the use of which is the most extended through the centuries. Tallow candles for the poor, wax-candles for the rich—such has been the only illuminating material of our ancestors. Its

consumption has increased; but the system remains the same. It was only in the second half of the eighteenth century that the oil reflecting lamp appeared, and in 1784 that the invention and exploitation of the argand oil-lamp, with a double current of air, distinctly marked the point of separation between ancient and modern lighting.

Characteristic Periods of Lighting.

From this period, in a few lines, may be given the succeeding stages.

1800–1820.—Improvements in the argand lamp, Carcel and Gagneau oil-lamps, and, above all, in lighting by gas, the invention of Philippe Lebon, with whose name must be associated those of Murdoch and Winsor.

1820–1840.—It was only after 1830 that lighting by gas practically established itself—that it transformed the public lighting of towns, and at the same time came little by little to revolutionize interior lighting of houses. At the same period, a considerable difference was brought about in inside lighting by the invention of the stearic composite candle, made commercially by De Milly from 1834, who thus gave a fatal blow to the wax candle.

1840-1860.—Development in the foregoing lights, and especially in gas lighting, which at the end of this period (1855) received a new impulse by the fusion of the different gas companies lighting Paris into one powerful company.

1860–1870.—Outside the development of gas lighting, which continued, this period is marked by the appearance of the mineral oil-lamp burning petroleum discovered in the United States, and imported into Europe after 1861. The cheapness of petroleum, the absence of any mechanism in the lamp using a volatile liquid, and consequently the simplicity, and low price of the petroleum lamp, allowed of its rapid development, and entirely modified private lighting, especially among the labouring classes.

1870–1880.—This period is marked by the entrance into the first rank of a source of illumination—the electric light—which has created a new era in the art of lighting, continuously raised its level, and strongly stimulated rival methods of lighting. It was in 1878 that the Jablochkoff lamp made its appearance in the Avenue de l'Opéra, giving the electric light a start which could not be stopped, and which was soon followed by the incandescent electric lamp in 1880. Lastly, after the electric light, we have yet to record the new inventions of acetylene, carburetted gas—long before known, but the manufacture of which was not practical before 1894, at which time carbide of calcium had been made in the electric furnace. Acetylene, by reason of its great illuminating power, and the essentially portable character of its producing apparatus, is of real value in a number of special circumstances. This rapid survey is sufficient for you to take account of the course that has been traversed during a century.

Flat-Flame Gas-Burners.

Turning to the subject of progress in gas lighting, M. Cornuault mentioned that it was on Jan. 1, 1829, that the first gas-burners were installed (in Paris) on the public thoroughfare—in the Place du Carrousel, and afterwards in the Rue de la Paix, &c. In 1835, there were 203 gas-burners in the whole of Paris; in 1839, there were 1162 gas and 11,654 oil burners; in 1848, 8600 gas and 5880 oil; in 1852, 13,733 gas and a few hundred oil burners. The gas-burners generally used were of the batswing type, enclosed in lamps and giving a flat fan-like flame. These burners were classified in 1843 by Fresnel, thus:—

	Consumption.	Lighting Power.	Consumption per Carcel.
	Litres.	Carcels.	Litres.
Batswing burners, 1st series ..	100 ..	0·77 ..	129
,, ,, 2nd ,, ..	140 ..	1·10 ..	127
,, ,, 3rd ,, ..	200 ..	1·72 ..	116

Besides the slit batswing burner, the candle (or jet) burner was used; then a burner with glass chimney and double current of air—in imitation of the Argand lamp, later on known as the Bengel burner. The latter has been very minutely described by Dumas and Regnault, in their classic instructions, and it is used for tests on the gas in Paris and elsewhere. The standard burner gives the carcel for an hourly consumption of 105 litres of gas. Of course, more powerful burners were made, but rarely higher than 200 to 300 litres of consumption, and so of 2 to 3 carcels in power.

Intensive Burners.

Such was the situation, when, in 1878, the electric light (the Jablochkoff candles) appeared in the Avenue de l'Opéra. Gas engineers were rather agitated—why should they not own up to it?—and exerted themselves to show that with gas they could do as well, even if not better, and at less expense. This profitable ambition was encouraged by the City of Paris, which in 1879 gave over the Rue du Quatre-Septembre, near the Avenue de l'Opéra, to the Gas Company as an experimental quarter. The first idea was to group several flat-flame burners in the same lamp; and it was thus that arose the intensive burner known as the "Quatre-Septembre," which made a sensation at the time. It was composed of six large slit-burners of 6-10ths of a millimetre, each consuming 233 litres (8·228 cubic feet) of gas per hour, or a total of 1400 litres (49·444 cubic feet), arranged on a circle 16 cm. ($6\frac{5}{16}$ inches) diameter. This burner, a kind of decorative fire-vase, gave an intensity of about 13 to 14 carcels. The comparison between the intensive gaslighting in the Rue du Quatre-Septembre and the Jablochkoff electric burners in the Avenue de l'Opéra may be shown as follows:—

Gas . . 0·15 carcel per square metre; cost per hour 14·56 fs.
Electricity . 0·05 ,, ,, ,, ,, ; ,, ,, ,, 19·20 ,,

The advantages lay very much with gas, and the Jablochkoff lighting temporarily disappeared from the Avenue de l'Opéra in the year 1882.

Before the success of the 1400-litre intensive burner of the Quatre-Septembre, another type of the same class, but of 875 litres, had been made; and, by the report of M. Cernesson, in December, 1878, to the Commission of the Municipal Council, the establishing of these new burners was authorized. So that, for example, the amount of light in the Rue du Quartre-Septembre was increased in the proportion of 4·2 to 112, and in the Place du Château d'Eau of 10·7 to 80. The first benefit, then, of the electric light was considerably to increase the amount of light distributed on the public streets. The free air intensive gas-burners continued to extend during the following years, and in Paris there were: In 1882, 279 burners of 875 litres, and 466 of 1400 litres; and in 1888, 379 burners of 875 litres, and 1126 of 1400 litres. But in the meanwhile, hot-air regenerative burners made their appearance, and after some years of experimenting, succeeded in replacing, little by little, the cold air intensive burners which ended by disappearing almost entirely.

Regenerative Burners.

The first hot-air burner is due to a Frenchman, Chaussenot, who showed the advantage accruing from raising the temperature of the air supplying the combustion of the gas of a burner from the point of view of increasing the resulting illuminating power. As far back as 1836, he obtained a prize from the Société d'Encouragement for his lamp, combining, as the report said, "the most effective means for increasing the illuminating power of flames produced by the combustion of gas." But it was not until much later, in 1879, that Herr Frederick Siemens, adopting the fecund method of recuperation for heating the air (already applied to industrial heating), rendered practical Chaussenot's idea, and formed the regenerative intensive burner, which had its period of success. I had the honour of showing the first Siemens burners introduced into France to the Société des Ingénieurs Civils twenty-six years ago (on Jan. 21, 1881), and of explaining the principles upon which they rested. It will suffice for me briefly to remind you that it is to the incandescence of the particles of carbon given off by the decomposition of carbides of hydrogen that is due the illuminating power of gas; and that the particles of incandescent carbon give more light if they are carried to a higher temperature. It is an analogous phenomenon which is observed in incandescent electric lamps. When they are, as is commonly said, "pushed," they give more light and a whiter light—the light restricting the more refrangible rays. Therefore, to obtain a higher temperature of flame, Siemens heated the air necessary for combustion, by utilizing or recuperating for this purpose the lost heat of the products themselves of combustion. Within practical limits—that is, between 0° and 400° or 500°—the yield was improved, according to the experiments of M. Sainte-Claire Deville, by about 20 per cent. for each 100° the temperature was raised. It was under these conditions that the following principal types of regenerative intensive burners were made:

	Carcels.		Litres per Carcel.
Burners of 350 litres hourly consumption, giving	5 to 6	or	70
,, ,, 700 ,, ,, ,, ,,	13 to 14	,,	50 to 60
,, ,, 900 ,, ,, ,, ,,	20 to 22	,,	40 to 50
,, ,, 1600 ,, ,, ,, ,,	40 to 45	,,	40 to 50

It showed, therefore, both from the point of view of economy in consumption and power in production, considerable progress for the time.

These burners came into general use especially in Germany; but the unsightly form of the regenerators, the difficulty of disguising the side chimney, &c., prevented them from being seriously adopted in France, in spite of the trials made, in 1882, in the Place du Palais-Royal, and, in 1883, in the Rue Royale. It was only when the manufacturers, by placing the regenerator in the upper part, gave the flame the shape of a tulip burning in a glass cup suspended from the regenerator, that the regenerative burners extended to private lighting (1882-1885) under the names of Cromatie and Wenham burners. As for their application to public lighting, the Siemens burners always remained defective, until, in 1884, under the name of Schulke burners, new and improved Siemens burners, with regenerator above the flame, were introduced into France. The regenerator was constructed of nickel, the maintenance was less costly, and improvements in detail were made. In short, Siemens burners, and then competitive burners (Industrial, Parisian burners, &c.), were, about 1887, economical and remarkably powerful appliances for public lighting. Schulke burners of 750 litres, put up in 1887 in a Paris thoroughfare, gave 17 to 18 carcels; thus giving the carcel for 40 to 45 litres. They replaced, notably, the cold-air intensive gas-burners of the Rue du Quatre-Septembre, which consumed, as we have said, 1400 litres of gas per hour to give only 13 to 14 carcels. The number of regenerative burners on the Paris streets has been as follows: In 1889, 27; in 1891, 1444; in 1893, 2169; in 1898, 3570; and in 1899, 212. The decrease in the number after 1898 sufficiently shows that new facts had arisen in the interval—it was, indeed, that incandescent gas-burners, by the

discovery of the genius of Auer, began, starting from 1892, to work an absolute revolution in lighting by gas.

Early Incandescent Gas-Mantles.

The principle of incandescence had been known for some time. All solid refractory bodies, heated to a sufficient temperature, become incandescent, and the whole problem consists in reaching the necessary temperature under conditions obtainable in practice. The first application of incandescence was known under the name of the Drummond light, and dates from 1826; it was obtained by making a lime rod red-hot by means of a mixture of hydrogen and oxygen. Later, in 1849, Frankenstein, who seems to be the real precursor of Auer, brought to incandescence a woven gauze-net, previously steeped in a rather thick pulp prepared with equal parts of finely broken chalk, calcined magnesia, and water with gum arabic. He thus obtained, and introduced into the flame, a cone which we to-day call a mantle, and which he called a "multiplicator of light." Frankenstein gave the precise details word for word as follows: "The texture is immediately charred; at the end of some time the carbon burns and the earthy oxides only remain in the form of the original gauze; the cone is not long in becoming an intense red-white." I have thought it well to bring before you this exact quotation, which is truly striking to-day, and justifies what I have said before as to the precursory rôle of Frankenstein, which should not be forgotten.

In 1869, Tessié du Motay and Maréchal took up again the idea of Drummond, and in the Place de l'Hôtel-de-Ville, had a trial of the light, called oxhydric. This was, in fact, nothing else but the Drummond light, in which hydrogen was replaced by coal gas, and the lime rod by a pencil of compressed magnesia or of zirconium. Then, in 1882, Clamond introduced a mesh, or basket, formed of drawn-out magnesia, combined with a certain proportion of zirconium, into the flame of a burner with a double current of air. Profiting by Siemens's invention, he did not overlook the previous heating of the air of combustion, thus raising the temperature of the incandescence. The action of the burner was really satisfactory, and the Clamond burner, reversed or not, had its hour of success; but the basket was fragile, and its life ephemeral. There still remained to be discovered a sufficiently strong mantle, though without bulk, and becoming incandescent at a comparatively low temperature. All the bodies tried up to Auer had too great a mass, and were not susceptible of being brought, under usual conditions, to the necessary temperature in order to arrive at their illuminating incandescence. However that may be, the problem of incandescence has been really solved only by the invention of Dr. Carl Auer von Welsbach, of Vienna, formerly a pupil of Professor Bunsen at the University of Heidelberg, who brought to the gas industry a weapon of the first importance, of which it had begun to have great need—let us recognize it—in order to confront the continuous progress of its young and brilliant rival, electricity.

(To be continued.)

Société Technique du Gaz en France.

A circular-letter, dated the 14th inst., and signed by M. Coze, this year's President, reminds us that the next annual meeting of the French Gas Society will be held at Nancy on the 11th of June and following days. The last date for the sending in of papers is the 11th of May, though members are asked to advance this date if possible. We are pleased to find that the date of the French congress will not clash this year, as it did last, with the meeting of the Institution of Gas Engineers—more especially as this year's meeting in Dublin is to partake of something of an international character. A new departure is being made by the Society, and a special circular has been sent out concerning it. To make the technical gatherings at the congress still more interesting, a special meeting will be reserved in the future for a series of general discussions on questions decided upon beforehand. Everyone will be able to express his own opinion on these chosen subjects, and can mention to his colleagues the processes or practices he has adopted in analogous cases to those being considered at the time. Members are asked to state now what questions they think should be discussed at the Nancy meeting. The subjects which are suggested by the greatest number of members, and which present problems of urgency or of actual practice, will be announced in due time for consideration. We welcome this new proposal, and trust and believe that it will add to the practical importance of the work of the annual meetings, and prove of real assistance to many members.

Scottish Junior Gas Association.—The members of the Western District Section of this Association will visit the fire-brick and retort works of Messrs. Dougall and Sons, Bonnybridge, next Saturday, when Mr. E. M. Stewart, the Manager, will read a paper entitled "Fire-Bricks and Retorts." At the close of the visit, the company will be entertained at tea by the firm.

"Punch's" Suggestion to Marylebone.—Among the Charivaria in the current number of "Punch," there appears the following paragraph, which contains what may prove a useful hint to the Marylebone Borough Council: "There has been a further failure of the Marylebone Council's electric supply; and it is suggested that the Council might make a handsome profit by selling candles for use on such occasions."

THE TREND OF GAS INVENTION.

In making our usual review of the abstracts of patent specifications that were published in the "Journal" last year, a point that first obtrudes itself upon one's notice has quantitative significance. It is not many years ago when the total of the abstracts published by us in a year was, with notable consistency, somewhere in the neighbourhood of 200, and then, in the smaller quantity, there was not the same necessity as now for discriminating between the specifications of the useful or promising and those that are of small account—many obviously only being what may be termed protectors of minor details. This weeding out notwithstanding, the last four years have seen a very considerable increase in the number of specifications that have been dealt with; and although there has been no intention of getting any numerical concordancy, it is interesting to observe how closely the specifications dealt with year by year have had numerical similarity. In 1903, 310 gas specifications were dealt with; in 1904, 298; in 1905, 322; and in 1906, 310. It was in the years preceding that the totals receded considerably from these figures.

Carbonization and the Means—Recollections of the Grice Drawer-Charger.

First taking those specifications falling within the carbonization department—that is to say, including gas production to the hydraulic main, and coal and coke plant—the number summarized and illustrated during the year reached 42, of which only 14 were importations. Analyzing the subject-matter of the specifications, nearly everything is found to be dealt with within the limits of this section. There has been what may be described, for these times, as a considerable amount of attention given to the heating of retort-settings. At least five specifications have been published that exhibit this purpose. Though they appear under a variety of descriptive headings, their intention has relationship. One inventor twice directs attention to the gas and air passages of regenerative furnaces and the tiles used therein; and another aims at a "better distribution of the producer gas and secondary air over the whole length of the combustion chamber." From abroad came proposals for the "regulating" of the temperature of retort-ovens; and one treating of the heating of retorts of great length. In connection with ordinary retorts, there was a novel home plan described for making two or more retorts in one piece — among the advantages claimed being economy in space, improved and more regular heats, increased life, and economy in ironwork. With a view to increased structural strength, there was a proposition for making the heads of retorts with a solid end piece, forming part of the masonry of the bench. This was a suggestion from abroad. Before leaving the ordinary horizontal system, the activity in the production of new charging and discharging arrangements should be noted. Machines operating from both sides of retort-benches have, over the period covered by the patent specifications, been totally neglected. The specifications tell only one tale, and that is how extensively the practice of charging and discharging retorts from one side of the bench has commended itself to gas engineers. Rotary projectors and ram discharging machines have their fresh arrivals; a proposal was made for charging retorts by steam-jets; and there is one machine which proposes to compete with the only existing representative of the principle of simultaneously discharging and charging of retorts.

This latter system of operation is, without doubt, going to take its share of future favour among gas engineers. It may therefore be of interest to call attention to the fact that a machine designed to discharge and carry forward a new charge in, practically speaking, one operation was designed by Mr. W. Grice, as far back as 1884, and was illustrated and described in the "Journal" for Aug. 25, 1885 (p. 343). This machine was tried in No. 3 retort-house at the Saltley works of the Birmingham Corporation; but it was not at the time successful. We have made inquiries of Mr. Henry Hack as to his recollections concerning this machine, as nothing appears to have been placed on record in respect of it after the publication of the patent specification and the exhibition of a model of the machine at the Manchester meeting of the Gas Institute in 1885. Mr. Hack has kindly given us some information, and has also interested himself in the matter by inquiring of Mr. Harry Grice, and Mr. J. W. Morrison, the Engineer of the Sheffield United Gaslight Company (who was at Saltley at the time), as to their recollections of the experiments with the machine. By the machine, it appears, the coke was drawn from the retort by the inward stroke of the pan, and the coal charge deposited in the retort by the outward stroke; so that, although both operations were performed by once inserting the pan in the retort, they were not performed simultaneously. Mr. Harry Grice (who carried out the trials at Saltley) says that the machine, with the exception of the shoot and chain, was constructed of cast iron; and he attributes its failure to the continual breakdowns due to the large use made of this material. Mr. Morrison says the machine was cleared out because it left the coal all of a heap in the retort, instead of evenly distributing it; and that the charging-pan, being all in one piece, practically the width of the retort—and non-flexible—jambed itself with any small pieces of coke that happened to be left in the retort. Mr. Hack's memory practically agrees with Mr. Morrison's statement, but he thinks that Messrs. Grice and Sons were not wise in making no attempt to improve the working of the machine, and were too

precipitate in scrapping it. They spent a lot of money upon the plant; and one can understand that they got disheartened, and so gave the job up as a bad one. On looking at his report-book Mr. Hack finds that the following appears under date of Dec. 18, 1890: "The charger has been at Saltley since May last. Work has been going on on it ever since; and as it was causing us considerable inconvenience, and I could see no prospect of it ever being of service to us, I requested Messrs. Grice to remove it, which they are now doing. Several attempts were made to draw and charge the retorts, with indications of success, but the principal cause of failure is that they made the sides of the tray and the blades of the chain rake too deep, causing it to jam in the retort, which could only be avoided by the attendant adjusting the tray to the retort to a degree of nicety that would be impracticable in ordinary working. Another difficulty was that they had only made the tray and chain rake long enough to draw and charge a retort 8 feet long (excluding the mouthpiece), instead of 10 feet, the length they knew all ours to be."

Inclined retorts have been sadly set aside by inventors. Only one specification throughout the year had reference to them, and that described a method of charging. Vertical retorts, on the other hand, have been in great evidence—the Woodall-Duckham being particularly prominent with the various patents the inventors have taken out to overcome the difficulties and meet the requirements found in their lengthened and careful investigation. The specification of the Young and Glover system was published in the course of the year; and a modification of the Dessau system was described. The continuous feeding of vertical retorts is a feature of most of the arrangements that were noticed; but one patent from abroad was more especially devoted to describing one means of accomplishing this. Another specification specifically announced that the intention of the patentee was to produce, by the vertical retort, coal and water gas, though this is not an unknown purpose of other systems that have already been mentioned. Besemfelder's arrangement, too, for continuous carbonization, and the production of mixed coal and water gas, also saw the light of day—in descriptive form. A specification from abroad referred specially to the construction of furnaces for vertical retorts.

Among miscellaneous subjects in connection with retort-house operations and equipment, attention was directed to a much criticized proposition for the blending of producer gas and coal gas, to the carbonization of raw combustible materials containing large quantities of water, to a belated attempt to produce economy in the enrichment of gas by the aid of husks or shells of cotton seed, to a plan of utilizing superheated steam for the destructive distillation of coal and other substances, to the utilization of coke breeze in retort furnaces, to a method of introducing steam into retorts, to the application to retorts of a water-spraying device for the removal of carbon, to a plan of measuring and delivering coal to retorts, and to a system of making briquettes from coal dust, lime, and pitch for carbonization, in order to produce lighting gas and a dense coke. Improvement in bench mountings appears to have almost reached a state of finality; for standpipes and connections were only referred to once, and retort-lids the same. Great Britain monopolized consideration for coal and coke elevators, with three descriptions of improvements in details, and one of a fresh idea for controlling and regulating the feed of coal to elevators and conveyors.

Other Gas-Manufacturing Systems.

We have in this review removed from the ordinary carbonizing section those systems of gas production that depart from gas-works ordinary practice, but some of which are, with time and changed view, becoming very closely identified with the condition of things that the course of events appears to be leading to. It cannot be denied that the vertical retort draws closer the relationship between gas-works practice and the methods of manufacturing producer gas. We have been describing vertical retorts, and here we have a connecting link in a British specification, which delineates a plan for simultaneously making coal gas and producer gas by the disposition of a vertical retort inside the producer of a gas-generator. That secures most intimate relationship. Then we pass on to find that the gas-producers to which it was thought fit to accord notice during the year were only three in number. Leaving them, it is interesting to remind readers of the presentation of a system for the manufacture of a non-toxic gas, free from the objection of naphthalene and similar deposits in the mains. In this case, the carbon monoxide is removed, and in its place is the valuable and non-toxic constituent methane. This looks very attractive; but more definite information is required as to its practicability. Consideration was also invited to a plan for the production of a permanent gas by the passing of finely divided hydrocarbons and superheated steam over a heated contact material containing protoperoxide of iron. Getting further away from the utilization of coal for the production of gas, a vertical kiln was described for the gasification of peat; and an inventor who does not believe in waste described how power gas may be recovered in the process of lime-burning. The birth-rate of suction gas-producers shows no diminution in this country; but, of course, many of them are designed with the view of overcoming difficulties that will keep cropping up in connection with these plants. A couple of pressure gas producers from abroad were described. Connected with these types of plant may be mentioned an arrangement for controlling gas-engines working with poor gas. Carburetted air gas lingers; but we only gave to the system one notice during the year. The name of the originator of the Dessau vertical retort, appears in conjunction with a water-gas system; and there are a couple of British representatives in this field. Altogether, in this section, 22 specifications were noticed; seven being introductions from other countries.

Hydraulic Main to Gasholder.

Returning to the ordinary processes of the gas-works, specifications relating to plant and methods between the hydraulic main and the holder were dealt with to the extent of 21—four being importations. Attention continues to be given to devices for the regulation of the seals of dip-pipes; and to their sealing and unsealing. An idea for simplifying the collection of pitch from hydraulic mains was explained; and a suggestion was made for the cooling of gas issuing from dip-pipes in the hydraulic main. The purification department is not denied attention; nor were the year's specifications in this line devoid of interest. There is room for the development of purification processes that require less cumbrous plant and methods than the present. The abolition of lime purification lessens the requirement for purifier-boxes; and the service of purifier-boxes is being economized by the new internal arrangements for the better depositing and utilizing of the purifying material in them. There were two or three specifications treating of such matters. Then there is another patentee who assumes that he is able to successfully dispense with the ordinary condensing plant, and to conduct the operations of removing tar and ammonia simultaneously. Three specifications were devoted to telling how washing gas by liquids, in accordance with the methods described, was highly successful in its cleansing effect. A system of treating spent oxide for revivification came under notice. Regarding other plant a multiple way or change valve, with liquid seal, was alluded to; improvements in a station meter and a rotary meter were brought forward; and one inventor, in three specifications, showed that he had been busy in producing dependable anti-pulsators for gas-pipes, so as to enable inferential station meters to be used for gas-engines. A regulator for gas-heated steam-boilers was among the miscellaneous contrivances of the year. In connection with gasholder work, a description of Mr. Gadd's improvements in columnless gasholder guiding was placed in the possession of readers; the only other mention of gasholders having reference to an anti-freezing device.

Distribution Department.

When we leave the gas-works, there is such a miscellaneous collection of devices in the distribution and lighting sections that they can only be dealt with most cursorily. Coming within the distribution section, are specifications numbering 39, and comprising all sorts of subjects ranging from lamplighters' torches to couplings for pipes; but only seven of the patents crossed the seas. It is again interesting to observe that the greatest activity prevailed in the meter department, and that history continues to repeat itself, in that the prepayment meter has not been courted much by inventors abroad—that is, if judgment can rest solely upon the small amount of protection sought for by them in this country. Eleven specifications dealing with prepayment meters were epitomized; and only one of them was not of native origin. Stop mechanism puts in a single appearance. While a lock and a special drawer are proposed for the prevention of depredations in connection with prepayment meters, another proposition is a system for using tokens instead of cash. A further invention proposes the combination of a change-giving apparatus with prepayment meters—an idea that, so far as this country is concerned, is not likely to receive any great encouragement. Occasional notices had to be given to ordinary meters—but only three all told. A differentiating meter engaged attention, and a meter that is invested with the duty of delivering its own bills was also described. Means for facilitating work on distribution mains have been devised—among them being a method of drilling and tapping gas-pipes under pressure, and another for ascertaining whether plugged pipes have been closed absolutely tight. The provision of leak-detecting chambers was the object of a further patent. Protection has been obtained by an inventor abroad for a mechanical arrangement for increasing pressure in gas distribution; and for the purpose of synchronizing clocks, a system of temporarily increasing gas pressure was described—this having reference to the development at Leamington. No less than three home proposals were introduced for measuring and recording the volume of gas and other liquids flowing through pipes.

Utilization.

The field for the utilization of gas is large; and the specifications of patents that we noticed were in consequence numerous—too numerous for anything like individual mention of the subjects. If we include incandescent matters, it is found that in this one section alone no less than 158 specifications were dealt with in the year, or more than half the total number—77 being natives, the remainder coming chiefly from the Continent, America also contributing. If, again, we exclude all the sundries and the lighting and extinguishing arrangements, it is seen that 87 of the specifications are identified with incandescent lighting in one way or other. We are afraid that incandescent lighting offers a "fatal facility" to people for enrolling themselves, or for fancying they are entitled to be enrolled, among inventors. The title of some of them it is difficult to appreciate; and the utility of certain productions we fail entirely to detect. Several ordinary burners, with variations—mostly small—in their construction, were noticed. Anti-vibrating arrangements still continue to find some favour with

designers. We are reminded once again of the application of a fan inside burners for increasing velocity and thoroughly mixing the gas and air supply. High-pressure and self-intensifying gas-lamps have been improved in certain instances by obtaining over them a better control and improving their fittings. Compressed-air supply for incandescent lighting has received more prominence; and means of compression for both gas and air have not been neglected. Coming to inverted burners, we have had in connection with them, if we except lighting and extinguishing devices of all kinds, the largest number of specifications to notice—their number being 28, of which 14 were originated in this country. Among the prominent features, the question of the regulation of supply has been studied, and the necessity of accessibility for cleaning has been recognized—a wonderful arrangement of lamp hinged in every part being one of the productions. We have had burners of a cross-breed, in which vertical burners are used with mantles formed and arranged (in one case the mantle is of saucer shape, with a central hole for the burner) to give the appearance and advantages of the inverted burner with the advantage (whatever it may be in such a case) of retaining the vertical form of burner. In one or two other instances conbination fittings with vertical and inverted burners have been designed. Quest for stronger mantles, it is seen, goes on with unabated vigour—some attacking the problem in connection with the fabrics, others relying on artificial silk and a second impregnation—in one case with hydrogen peroxide, as recently fully described in the "JOURNAL"—and again a framework of fine metallic wire is proposed. A curious idea was introduced in a mantle composed of a plurality of hollow sections forming a ring. The practicability of many of these ideas has to be demonstrated. If a small proportion of them will only do in ordinary use what their inventors claim for them all, we shall have made very substantial progress in incandescent gas lighting.

Grouping all the remainder of the arrangements in the department of utilization, it is remarkable, in the first place, how year after year lighting and extinguishing devices retain hold of inventors. If such things have been a felt want in the gas industry, there ought not now to be any difficulty in providing, from the huge pile of ideas in this category, several suitable arrangements. We have in the twelve months chronicled thirty or more forms of appliances and methods under this head—two-thirds of which have had origin outside this country. Safety taps and burners have been described. There has not been anything of striking importance among the specifications in connection with fires, stoves, or gas-engines, though several have received notice.

Residual Products.

Here there has been unwonted activity, in which this country has participated in no mean degree; but we are afraid, from what is gathered from the specifications, that the gas industry will not be substantially bettered by the inventions—excepting may be from those that enable spent liquor from sulphate plants to be disposed of without nuisance. The utilization of tar for paving has found its way to notice on two occasions; and some proposals refer to improving the recovery of ammonia, tar, ferrocyanides, sulphocyanides, pyridine, sulphur, and so forth. Sulphate of ammonia manufacture was dealt with in one or two instances.

Gas Testing and Analysis.

The published specifications in this the final section comprised the Carpenter and Grafton testing-burners, a couple of calorimeters, and an apparatus for estimating and recording the quality of gases by a comparison of the densities of different gases as exhibited by their relative rate of diffusion through a porous septum. Gas analysis and the measurement of high temperatures were not altogether lost sight of in the patent record.

We have received the first number of the "Natural Gas Journal," a new monthly publication devoted, as manifest by the title, to the interests of natural gas. Its principal feature is a report of the proceedings at the first annual meeting of the Natural Gas Association of America, held in Kansas City last June, with a portrait of the President (Mr. Kerr Murray Mitchell); and the other matter consists of news items from various localities. The Managing-Editor is Mr. J. Alex. Mayers, who appears to be well known on the other side of the Atlantic in connection with the supply of natural gas.

At a conference of motorists and others interested in the condition of the country roads, held at the suggestion of Lord Montagu at the Automobile Club last Thursday, it was decided to form a National Dustless Roads Committee. The purpose of the Committee is to amalgamate all the individual and combined efforts that are being made in this direction, and to take advantage of the experience of individuals and public bodies who have been making experiments in the treatment of roads with the object of preventing the nuisance of dust that exists at the present time. A meeting of the Council of the Roads Improvement Association will be held to-day, to give effect to this resolution; and they will also settle the rules for a competition to determine the best form of tar or preparation of tar to be used for road purposes. This competition is supplementary to the one for the best tar-spreading machine referred to in the "JOURNAL" last week (p. 144), the rules for which have already been issued.

THE CEROFIRM MANTLE.

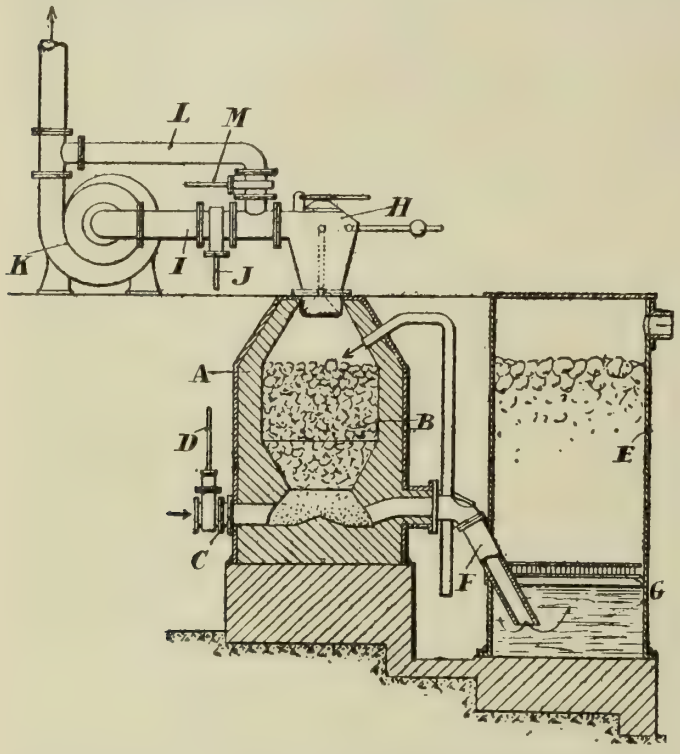
THE "Cerofirm" gas-mantle was yesterday introduced to a number of gentlemen in the City, at a little meeting specially arranged to demonstrate its merits. This is the mantle which formed the subject of a highly interesting article by Dr. C. R. Böhm in our columns on the 25th ult.; and those who saw the demonstrations with the mantle yesterday, and those who read this brief reference to what was seen, will desire to most carefully study that article for the purpose of ascertaining just wherein the mantle varies from the ordinary forms of manufacture. As was pointed out in the article, the base of the mantle is artificial silk, the fabric is impregnated in the ordinary manner, and then the thorium salts are heated with hydrogen peroxide; and, by this treatment, a thorium hydrate is obtained which does not expand but coheres. Now what is claimed is that the discovery of this particular treatment gives an exceptionally strong and flexible mantle and a mantle whose illuminating properties are well preserved. So far as it was possible to do so in a short time (except, of course, with regard to the illuminating power), Herr Bruno and his colleagues who are interested in the mantle demonstrated the veracity of their contentions. Several samples of the mantle were burned off in the presence of the visitors, then placed on a shock machine, and subjected to an arm-tiring number of violent vertical shocks—without damage. Mantles were twisted round the finger—without damage. Mantles were hooked on to the free end of a pliable wire held fixed at the other end, and the skirt of the mantle was pulled until the wire was bent—again without doing any damage to the mantle. There could be but one opinion that the mantle justified the claim to excellent merit in this regard; for practically all the violent treatment that a mantle could be subjected to without intentionally wishing to terminate its useful career, these mantles stood most boldly. The mantle, after being folded, too, revealed its fine elasticity by regaining its shape immediately on being replaced on a burner. Examples were also immersed in water to show that the valuable constituents of the mantle are insoluble in water, whereas it was possible by the same treatment to precipitate the salts of an ordinary mantle. The object of this test was only to demonstrate that the Cerofirm mantle was not in any way affected by moisture, nor by storage in damp places. With regard to the illuminating power of the mantles, there were no means of photometrically testing this; and as this is a mantle whose light, according to the inventor, is not at its best until (say) the lapse of several hours' use, it was not seen to the greatest advantage. But after a few minutes' burning, there was a distinct improvement to the eye in the illuminating power. Dr. Böhm, in his article, mentioned an average lighting power of 120 to 130 Hefner candles, with ordinary gas pressure and consumption; and certainly so far as yesterday's experience enabled judgment to be made, the mantle will give a good account of itself in this respect. But the striking feature was its structural tenacity, notwithstanding the beauty and fineness of its mesh. The mantle we learn has been largely adopted in Germany; and it is expected that it will not be long before we shall hear more about it in this country.

A "Water Arbitration" Prize Paper.

The Council of the Institution of Mechanical Engineers have announced that the Institution have received from the Metropolitan Water Board and Sir Edward Fry, the Chairman of the Court of Arbitration under the Metropolis Water Act, 1902, two sums of £250 each, which the donors desire to be used for some engineering purpose connected with the Institution. The Council have invested the amount—£500—in a trustee security, the income from which they have decided, after consultation with Sir Edward Fry, shall be offered biennially for a paper submitted in accordance with prescribed conditions. It has been further decided that the prize shall be known as the "Water Arbitration Prize," and shall be offered for a paper on an engineering subject, to be announced by the Council one year before the time for sending in the papers. The prize, which will have a value of approximately £30, will take any form which the Council may decide upon, and will be accompanied by a certificate bearing the seal of the Institution. The following are the conditions for the first award, to be made in 1908: (1) The award will be made to the author of the selected paper dealing with the filtration and purification of water for public supply. (2) Members, associate members, associates, and graduates of the Institution may compete. (3) Papers must be sent to the Secretary of the Institution, and reach him not later than Oct. 31, 1907. (4) Each paper must be clearly written, or typewritten, on one side only of foolscap paper, with a margin, and must be accompanied by an outline or synopsis of its contents of not more than 600 words. Any illustrations sent with the paper must be properly drawn to scale. (5) Papers submitted for competition will become the property of the Institution, and, at the discretion of the Council, may be either read and discussed at a general meeting or simply printed in the "Proceedings." Each paper must consist of original matter, written by the competitor himself; and the Council will require a written statement to this effect. Any paper not accepted for printing will be returned to the author. No paper which has been previously published will be accepted for competition.

A FRENCH WATER-GAS PRODUCER.

A patent has recently been taken out in France, by the Société pour l'Exploitation des Procédés de Production de Gaz Industriels, for a water-gas producer, the chief advantages of which are claimed to be the absence of all danger of explosion when it is at work, the greater facility with which it can be manipulated, and its inexpensiveness to construct. The producer is on the suction principle, and it is arranged as follows: A charging-vessel, shaped like a coal-hopper, placed directly above the generator, is connected by a gas-pipe with the fan or blower; and the hot gases are conveyed to the chimney by means of an auxiliary pipe without passing the fan—the latter pipe being utilized for starting the plant, as well as during cessation of work when the generator has to be kept hot. The fire-bars hitherto employed in producers of this type are done away with in the one under notice; and the charge of fuel rests either upon the bottom of the generator or upon the bed of clinker and ash formed in the course of work. The steam-pipe terminates in the upper part of the generator, and the gas-pipe, at the base, in the washer. Between the two vessels there is simply a hydraulic seal, so arranged as to allow the gas to pass easily into the washer.



The construction of the producer will be understood from the accompanying illustration. A is the generator, with its charge of coke B. Air is sent in through the pipe C, which is furnished with a damper D; and the gas passes into the washer E by the pipe F, the end of which, as will be seen, is below the water level G. H is the hopper, which is filled at the top, and emptied at the bottom by means of the lever shown. A pipe I, furnished with a damper J and a fan K, is connected with the hopper, as is another L, provided with a damper M, which has a large opening equal to the diameter of the pipe and another much smaller. This damper can be quite closed.

The action of the apparatus is as follows: When starting, the damper J is shut and M is opened to its fullest extent, so that the gases may escape by the pipe L. The bottom of the hopper is lowered by means of the lever, and the damper on the pipe C opened as required. At the time of heating up, this damper, as well as J, is fully opened, the damper M closed, and the fan K on the pipe I started. The damper J is open and M is shut during working. When the necessary heat has been attained, the fan is stopped, and the production of gas begins. The damper D and the bottom of the hopper are closed, steam is admitted by the small pipe, and the gas generated escapes into the washer through the pipe F. During the production of gas, opportunity may be taken to re-charge the hopper, so as to save time. When scurfing is being done, the damper I is kept closed and M is brought into such a position that the escaping gases can only pass out through its smallest opening. This damper is also brought into the same position when the producer is stopped at night and the heat has to be kept up.

Leaving out of consideration the advantages resulting from the abolition of the grate, the facilities afforded for scurfing, and the production of a good quality of water gas, which contains very little carbonic acid, and always leaves the apparatus at the hottest part, a point worthy of attention is that loss of steam due to defective joints is impossible, as there are no joints. Moreover, all danger of asphyxiation from the chimney gases is avoided, as when the bottom of the hopper does not happen to be quite closed, only steam can escape, as it is this, and not water gas, that fills the upper part of the generator during its operation. Nor does any escape of gas take place during the process of heating up, as there can be only one suction of air. Consequently, the shutting-off portions of the apparatus have not to be adjusted so carefully as in other gas-producers.

A NOVEL INVERTED BURNER.

The current number of the "Journal de l'Eclairage au Gaz" contains a description of a new type of inverted incandescent gas-burner which has lately been brought out by the Société Française de Chaleur et Lumière, who are the French makers of the Kern burner. It is shown in the accompanying illustrations.

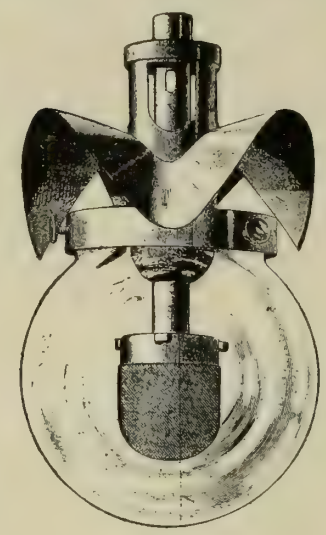


Fig. 1.

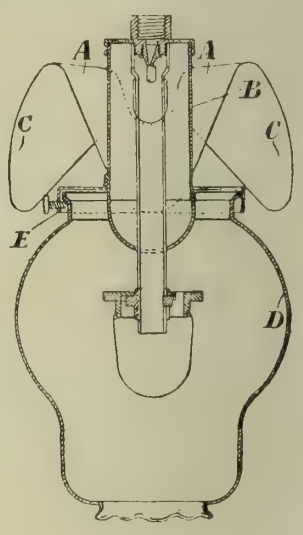


Fig. 2.

It will be seen from fig. 1, which is a general view of the lamp, that it is surmounted by a hood or cover of peculiar form, by the use of which, the makers claim, the current of air is directed upwards on its way to the burner, while the products of combustion are made to take a horizontal course, with the result that the pure air necessary for the supply of the burner does not mingle with them. Referring to fig. 2, which is a vertical section of the lamp, A is the hood or cover (its special feature), by the inclined sides of which the air is directed up to the openings into the burner-tube B; the other sides or wings C leading away the hot gases rising from the globe D by means of openings in the burner crown E. By this arrangement, the products of combustion are separated from the air going to the burner, and consequently the conditions for ensuring perfect combustion are realized. The bunsen burner consists of a tube of some metal which is a bad conductor of heat, such as iron, nickel, &c., surrounded by a jacket which prevents the products of combustion coming in contact with the burner, and overheating it. The intermediate space may be filled with some insulating material. The application of a casing, as described effectually prevents the return of the combustion gases to the burner, and thus removes a frequent cause of poor light.

Oil Shales of the Lothians.—The Geological Survey has prepared a valuable memoir on the oil shales of the Lothians. It is divided into three parts, the third of which, by Mr. D. R. Stewart, Chemist to the Broxburn Oil Company, deals with the chemistry of the oil shales and the processes and products of manufacture. The whole report, which has been edited by Dr. Horne, forms, it is believed, the most complete monograph that has been written on the subject. The importance of the industry in Scotland is shown by the fact that in 1904 a total of 2,332,000 tons of oil shale was mined, yielding 62,932,000 gallons of crude oil, from which was produced 2,517,000 gallons of naphtha, 17,000,000 gallons of illuminating oil, 38,000 tons of gas oil, 39,500 tons of lubricating oil, 22,500 tons of wax, 49,600 tons of sulphate of ammonia.

Local Government Annual.—We have received from the office of the "Local Government Journal" the sixteenth issue of the above-named annual, which has just been published. The main portion of the book is, as usual, devoted to the directory, which gives the names and addresses of the chief officials of all Corporations, London Borough Councils, County Councils, and other bodies throughout the kingdom. A feature which will be found useful is the insertion of the names of the Chairmen of Committees in the Metropolitan Boroughs; also the Chairmen of the London County Council Committees. The names and addresses of the Metropolitan Water Board are also included, and accompanied by a complete scale of charges for water in every district supplied by the Board. The charges for gas are also given. In addition to the directory, the book contains a good deal of information which will be valuable to persons connected with local government. It is edited by Mr. S. Edgecumbe Rogers.

OBITUARY.

The death took place at Arundel last Wednesday of Mr. Charles Marshall, a well-known resident of the town. He had filled the position of Engineer at the Duke of Norfolk's water-works since their opening about twelve years ago.

We regret to learn, from MM. Desclée Frères et Cie., the owners of the gas-works at Roubaix, of the death of M. Aimé Wautelet, their Manager. Deceased was a civil engineer, and a member of the Société Technique du Gaz en France, having been elected in the year 1899.

The current number of the "American Gaslight Journal" contains an account of the life-work of Mr. Adam Weber, whose recent death, at his home in New York, at the advanced age of 82, was announced in the preceding issue. Deceased was born in 1825 at Bechtheim, in the Grand Duchy of Hesse Darmstadt, and was articled to his father, an architect and builder. When quite a young man he left his home for New York, and after carrying on a successful business as a builder, he, in 1855, established the first large fire-brick factory erected in the United States—the style of the firm being Messrs. Kreischer and Weber. The partnership, however, was very soon dissolved, and the succeeding firm, Messrs. Maurer and Weber, constructed in New York City the then largest fire-brick factory in the country. As the result of his intimate knowledge of fire-clays, Mr. Weber conceived the idea of putting upon the market clay retorts to supersede the iron ones then generally in use in gas-works. Success attended his efforts, and he soon had a large business. He patented several arrangements of retort-benches; among them being his half and full depth regenerative furnaces. He personally superintended the equipment of the retort-houses of the principal New York Gas Companies; and his name was known not only in almost every city in the United States, but in South America, Cuba, China, and Japan. He also devised an improved lime process for the removal of carbonic acid from gas. His friends in the gas engineering profession included all who were actively engaged in it between 1850 and 1900. In the last-named year, he relinquished the business in favour of his two sons, Mr. Oscar B. Weber and Mr. Albert J. Weber, the former of whom died suddenly rather more than two years ago. Deceased was a prominent member of the American Gaslight Association as well as of the Pacific Coast Gas Association; he was on the rolls of the American Engineers' and other clubs; and was connected with numerous enterprises—being one of the largest shareholders in the Consolidated Gas Company—as well as with civic and charitable societies. He was likewise a prominent Freemason. The funeral, which took place at Greenwood Cemetery, was attended by many representatives of the gas industry; among them being Mr. W. H. Bradley, the Chief Engineer of the Consolidated Gas Company, who had been intimately acquainted with Mr. Weber for forty years. Deceased is survived by his widow, two sons, and two daughters.

WATER BILLS FOR 1907.

Second Article.

In the last number of the "Journal," we noticed the Bills to be introduced next session by Water Companies. We now deal with those promoted by Local Authorities which contain provisions in regard to water supply.

The Ashton-under-Lyne, Stalybridge, and Dukinfield District Water-Works Joint Committee wish for an extension of the period limited by the Act of 1870, under which the Committee was constituted, as amended by subsequent Acts, for the completion of such of the works thereby authorized as have not been carried out, to ten years from the passing of the Bill, so far as the Chew reservoir is concerned, and in respect of the other works to the time when they will be required. Authority is sought to acquire additional lands within three years from the date of the Royal Assent being given to the Bill. The Committee desire to have their powers strengthened in regard to the protection of water from pollution. It is proposed to increase the contributions of the authorities constituting the Committee towards the expenses of the joint undertaking. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Birkenhead Water Bill is to empower the Corporation to obtain a supply of water from the Rivers Alwen and Brenig, in the county of Denbigh. The scheme is a very extensive one, as will be seen from the following outline of the works. It is proposed to construct three impounding reservoirs, one of them to be used for compensation purposes, two aqueducts or pipe-lines connecting the former reservoirs, and several road diversions, in the above-named county; a reservoir or tanks, two aqueducts, and a tunnel or culvert, in the counties of Denbigh and Merioneth; an aqueduct in the first-named county and in Flint; a reservoir or tanks in the latter county; an aqueduct, consisting of one or more lines of pipes, commencing at this reservoir and terminating at one to be constructed in the parish of Thingwall, in Cheshire; and an aqueduct running thence to the existing service reservoir of the Corporation at Flaybrick Hill, in the county borough of Birkenhead. Ten years are asked for the completion of the Alwen reservoir and the first line of pipes, with the accessory tanks and tunnel for the conveyance of water to the borough. Authority is sought to appropriate the waters of the two rivers named and their tributaries, as well as all streams or springs that may be intercepted by the works; but before using any of the waters taken, the Corporation are to provide compensation to the extent specified in the Bill, and also suitable drinking places for cattle. The Corporation ask to be empowered to supply water to local authorities, companies, or persons, and also to borrow such sums as they may require, not exceeding £1,750,000, for carrying out the scheme. But they do not propose to raise more than £800,000 until the first reservoir and pipe-line, with the accessory works, have been completed, and the contract for the construction of the second reservoir (to be situated upon the River Brenig) has been let. The money is to be raised by the issue of Corporation stock or by mortgage. Authority is asked to alter, as from the 29th of September next, the maximum charge for water used for domestic purposes, from £6 10s. to £12 10s.; and also to repeal certain enactments regulating the supply of water to the London and North-Western and Great Western Railway Companies. Provision is made for granting a rebate to owners and occupiers of all rateable hereditaments in the Oxton and Bebington wards of the borough if and so long as the charges for water supplied for domestic purposes by the Wirral Water Company are higher than those of the Corporation. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Birmingham Corporation Water Bill is to amend certain provisions of their Water Acts in regard to the repayment of moneys borrowed for the purposes of those Acts. The Bill is short, consisting of only the preamble and three clauses, of which the second is the most important. It sets forth that in the case of all stock created and issued or transferred, and all moneys borrowed on mortgage or bills, for the purposes of the Corporation's Acts of 1892, 1896, and 1902, and outstanding on March 31 last, it shall not be obligatory upon the Corporation to commence payments into the loans fund of annual sums for the redemption of such stock, or to create any sinking fund, until the expiration of sixteen years from the date of issue or transfer of the stock or of the borrowing on mortgage or bills. The enactment is not to impair or affect the obligation of the Corporation to make provision for the redemption of stock and to repay moneys borrowed on mortgage or bills within the period of sixty years mentioned in sections 68 and 69 of the Act of 1892. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Broadstairs and St. Peter's Union District Water Bill is to authorize the Urban District Council of Broadstairs and St. Peter's to construct additional water-works, and to confer upon them further powers in relation to their water undertaking. The works comprise a well and pumping-station in the parish of Eastry; an underground heading, consisting of a line or lines of adits and all necessary works connected therewith, in the same parish; and a line of pipes commencing at the well already mentioned, and terminating in a tower and tank to be situated in the parish of St. Peter Extra. Five years are asked in which to complete the works. The District Council require authority to make bye-laws for preventing the pollution of the water, and to repeal the section of their Act of 1901 limiting the rates and charges at which water is to be supplied for domestic purposes, so as to make the maximum charge £8 15s. per cent. per annum upon the gross estimated rental of the premises, according to the valuation list in force at the commencement of the quarter for which the rate accrues, or to the last poor-rate in the absence of a list. Power is sought to sell or let meters; and the Council wish to be relieved of the compulsion to afford a supply of water for domestic purposes for less than twelve months. Authority is required to borrow the sum of £54,000 for the purchase of land and the execution of the works specified; £5000 for new mains, extensions of service-pipes, and meters; the sum requisite to defray the expenses of obtaining the Act; and, with the approval of the Local Government Board, such further amount as may be needed in connection with the water undertaking. The first-named amount is to be repaid in sixty years, the second in thirty years, from the time of borrowing. The costs of the Act are to be liquidated within five years from the date of the Royal Assent; and the money sanctioned by the Local Government Board, within such period as the Board may approve. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The Coventry Corporation Water Bill is mainly to authorize the supply of water to the city by the Corporation of Birmingham. Power is sought to lay down a line of pipes commencing at the Whitacre pumping-station of the latter Corporation at Shustoke, passing through various parishes, and terminating in a service-tank to be constructed in Coventry, at a point adjoining the southern of the two existing service reservoirs at Coundon. Five years are required for the completion of these works. The Birmingham Corporation will undertake to furnish a supply of water for a period of sixty years, on terms and conditions fully set forth in the Bill. The quantity of water is not to exceed 100,000 gallons per hour, and the charge is to be 4d. per 1000 gallons, subject to a minimum rate of £1250 per quarter for a minimum of 75 million gallons delivered in that period; the supply of water to be given and taken within three months from the completion of the aqueduct, meter, and subsidiary works. The water is to be that which the Birmingham Corporation draw from the Bourne; but provision is made for a supply from their Welsh works. The charges for water for domestic purposes are based upon the rateable value of the premises supplied; but the Corporation may

sell by measure at a maximum price of 1s. 6d. per 1000 gallons. Authority is sought to borrow £81,000 for the purchase of lands and the carrying out of the works specified; also whatever sum may be necessary to defray the cost of obtaining the Act, and such further amount as the Local Government Board may sanction. A period of sixty years is required for the repayment of the first-named amount; five years for the second; and such time as the Board specify for the third. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Devonport Corporation Bill is, among other things, to confer further powers upon the Corporation in respect of their water undertaking. They wish for authority to lay down a line of pipes commencing at Walkhampton, at a service-tank to be constructed there, and terminating near the existing reservoir at Tamerton Foliott; another line commencing at Egg Buckland, and also terminating at Tamerton Foliott in a reservoir to be built; and a filter-bed in the same parish, adjoining the Crownhill filter-beds of the Corporation. Seven years are required for the completion of these works. It is proposed to alter section 19 of the Corporation's Act of 1902, relating to water-rates for domestic purposes, and base the charges upon the gross estimated rental of the premises supplied, as set out in the Bill; also to vary section 70, so as to make the dates of payment the first day of each quarter of the year instead of the usual quarter days. The Corporation seek to be empowered to make bye-laws for providing for the testing and stamping of water-fittings, and to enter into contracts for the supply of water in bulk beyond their limits, on terms and conditions to be agreed upon. Authority is required to borrow for the purchase of land and easements and the construction of water-works, £61,000; for blocking portions of the existing leat, £11,000; and for general water-works purposes, including the provision of new trunk and other mains, £8000—all to be repaid within sixty years from the date or dates of borrowing. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Heywood and Middleton Water Board Bill is to extend the time limited by the Heywood and Middleton Water Board Act, 1901, for the construction of certain works, and to confer further powers upon the Board with respect to their water undertaking. The works referred to were originally sanctioned in 1877; and the time specified for their completion has already been three times extended. A further period of ten years is now applied for, as well as additional powers in regard to the purchase of land. The Board wish to be authorized to borrow £120,000 for this purpose, and for meeting the excess expenditure required for the completion of the Ashworth Moor enlarged reservoir and other works authorized by the Acts of 1877 and 1901, including the payment of interest out of capital during construction; £5000 for making filter-beds; the sum necessary for defraying the costs and expenses of the Act; and, with the consent of the Local Government Board, such further amounts as may be needed. Sixty years are asked for the repayment of the two amounts above specified; but a period of seven years is required after borrowing, or eight years after the passing of the Act, before commencing the formation of a sinking fund. Provision is made for the transfer to the Board of the sum of £152,612 stock borrowed for the purposes of the water undertaking of the Heywood Corporation before its transfer to the Board, which, on March 31, 1907, is properly charged on the revenue of the undertaking; but from that date all the Heywood Corporation redeemable stock, except the above-named sum, is to cease as a charge on such revenue. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

The Keswick Urban District Council (Water) Bill describes and sanctions the existing water undertaking of the Council, authorizes the construction of works, and defines the limits of supply. The new works for which authority is sought comprise a line of pipes commencing at a point in a pipe coming from the intake on the Whit Beck, and terminating in the existing Millbeck reservoir, and a reservoir adjoining the one just named. The limits within which the Council wish to supply water are fully defined in the Bill, but cannot be indicated without the aid of an Ordnance map. The charge for water for domestic purposes is to be on the rateable value of the premises; and where the supply is by measure, the price is not to exceed 1s. 6d. per 1000 gallons—supplies in bulk to be furnished on terms and conditions to be agreed upon. The Council wish to be empowered to borrow any sum not exceeding £8400, to be repaid within sixty years. Separate accounts will be kept in respect of the moneys raised for the water-works undertaking, and the charges on the revenue thereof. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Leeds Corporation Bill is to sanction (*inter alia*) the construction of certain water-works. Before these are specified, however, those which it is proposed to abandon are defined. They include the Colsterdale reservoir, a portion of an aqueduct, a pipe-line, and two road diversions sanctioned by the Corporation's Water Act of 1901; and any damage done in respect of them is to be compensated for. The new works consist of a reservoir in the parishes of Healey-with-Sutton and Colsterdale, to be called the "New Colsterdale Reservoir;" an aqueduct commencing in the one of which a portion is to be abandoned, and terminating in the new reservoir just referred to; a covered service reservoir in the township of Armley and Bramley, and another in the township of Holbeck; and various conduits or pipe-lines and a road diversion. A period of nine years is required within which to complete these works; and the time-limit for carrying out those authorized by the Act of 1901 is to be extended till the expiration of five years from Aug. 17, 1911. This Act is also to be amended in regard to the supply of compensation water. The Corporation wish for authority to apply, for or in connection with the purchase of land and the execution of the works above specified, any moneys borrowed or to be borrowed under the Act already mentioned. [*Parliamentary Agents: Messrs. Sharpe, Parker, and Co.*]

YORKSHIRE JUNIOR GAS ASSOCIATION.

When Mr. Thomas Newbigging addressed the members of the Yorkshire Junior Gas Association at their annual meeting last October, among other pieces of advice, he urged them to acquire a familiarity with ordnance maps, and a facility in gaining from them all the information they contain—saying that though it might seem an out-of-the-way thing to recommend, he had constantly found that he had to have recourse to them in his professional career, and he had been surprised to find how ignorant of them many men were whose daily work would be materially assisted by a frequent and intelligent use of ordnance maps.

This advice was taken to heart; and in a few weeks the Secretary was able to inform Mr. Newbigging that arrangements had been made for an address on the subject to be delivered to the members. This was given on Saturday last, in the Lecture Theatre of the Halifax Technical School, by Mr. J. H. R. Appleyard, B.Sc., formerly Demonstrator in Geology at the Yorkshire College (now the Leeds University), who announced his subject as "Ordnance Maps: What They Teach Us, and How to Read Them." The lecturer had a large assortment of ordnance maps of all the scales on view, including specimens of the various geological survey maps, and of the various kinds of physical maps, large and small—especially those coloured to show the various levels. The lecture was really an informal lesson, illustrated on the black-board, &c., and followed by the members from the actual maps, as the lecturer was able to distribute among his audience a considerable number of copies of the four quarter-sheets (on the one inch to the mile scale) that cover the Halifax district. Members were invited to ask questions as the lecture proceeded; and full advantage was taken of this permission. Great interest was awakened in what was a notable feature of the lecture—viz., a set of eight relief models made the full size of the quarter-sheet maps. These had been built up by the lecturer and some of his pupils from the contour lines of the actual ordnance maps. The six quarter-sheets actually used in their preparation were affixed to the black-board, and the models were placed just below for comparison.

The sheets had had all the contour lines thickened out in alternate black and red lines—no light task, as can be proved by anyone who sets himself to do it. At least, it is no easy task on such maps as those of the Halifax district, which is intersected by deep, steep-sided valleys, and well populated. This means, of course, that the contour lines in parts are very close together, and, being much broken by names, are not easily followed, but may be confused with others. Sheets of cardboard whose edges were the exact shape and size of the various contour lines were then fastened on one another, and the whole mounted and painted. The elevations were somewhat exaggerated; the vertical scale being about two or three times the horizontal. Upon the meaning of contour lines, and the need of being by their aid readily able mentally to see the ordnance maps as physical maps, the lecturer laid great stress; showing the inter-connection of the ordnance map, the physical map tinted to indicate elevations, and these relief models. The most notable model of all was one specially prepared for the occasion—plainly at no small cost of time and trouble; and for this the liveliest admiration was expressed. It consisted of a relief model made as in the former instances, except that every exposed surface was a portion of the actual map; so that, looking down upon it, one saw the complete actual ordnance map of Halifax in high relief. No such map models as this are on the market; and as far as the lecturer had been able to ascertain, only one has hitherto been made in the geological or geographical departments in any of the Universities.

The meeting, at which the President (Mr. G. W. Fligg) occupied the chair, passed an enthusiastic vote of thanks to the lecturer, which was spoken to by several members. The Halifax Corporation Gas Engineer, Mr. J. Wilkinson, who has been suffering from an attack of influenza, sent a message of regret at being unable to be present at the first meeting held for some time at Halifax. Mr. John H. Brearley, the President of the Manchester District Institution of Gas Engineers, who was present, joined in the general appreciation, and congratulated the members on their enterprise in securing so able a lecture, and on their alertness in taking up a subject somewhat new to gas meetings. He remarked on the frequency of the loss and inconvenience arising to gas undertakings from not having a complete, accurate, and sufficiently minute map of the works' connections and mains and services, and suggested that some member might prepare a paper on the subject, showing how best to go about preparing such a map, and thus lay a good many seniors, as well as juniors, under obligation to him.

Masonic.—Bro. F. F. Farrand, the Engineer and Manager of the Ryde (Isle of Wight) Gas Company, was last Wednesday installed W.M. of the East Medina Lodge, No. 175, in succession to Bro. A. E. Coombes, the Secretary of the Company.

LIGHTING OF RAILWAY PREMISES.

Resumed Discussion on Mr. Fowler's Paper.

At the Meeting of the Institution of Mechanical Engineers on Friday, the discussion was resumed of the paper on the above subject, which was read at the December meeting by Mr. Henry Fowler, of the Lighting Department of the Midland Railway Company, Derby. An abstract of the paper, together with a report of the opening of the discussion, will be found in the "Journal" for Dec. 18, p. 818. The chair last Friday was occupied by Mr. E. P. Martin, President of the Institution.

Mr. George Hughes remarked that the lighting of a railway was not only of vast scientific, but also of enormous commercial interest. They would readily realize that the annual expenditure must be a very considerable sum. The lighting of a railway, in its comprehensive nature, embodied not only what the author had so ably dealt with, but also such items as train lighting, and the lighting of signals, hand-lamps, and of the head-lamps of trains. The paper itself to him was a valuable one; and he had no doubt it would form a very useful record for reference. The author told them that the selection of a lighting agent was necessarily of a restrictive nature, in the sense that every station or other point that had to be lighted, had to be considered independently. That was to say, every selection had to be made on its merits, as it were; and before this could be done, the selector must know absolutely the conditions. Mr. Fowler told them that they had in particular three agents—oil, gas, and electricity, without considering for the moment their subdivisions. He thought they all would admit that electricity had given a tremendous fillip to the gas industry; and he believed now gas lighting had become such a formidable competitor with electricity, that it in its turn would give a tremendous fillip to electric lighting. Suppose they selected a small country station. Their experience on the Lancashire and Yorkshire Railway was generally in employing oil-lamps giving about 11-candle power, and burning on an average five hours a day. The cost of these amounted to about ¼d. a light per diem. Now in a country station the only other available agent would probably be acetylene; and from their experience, this would cost, under the same conditions, about twice as much. Therefore for a small country station, oil came in first. Where gas and electricity could both be obtained, their experience was that incandescent gaslight, with an ordinary "C" burner, was the cheapest. The cost of this amounted in their case to just under 1d. per light for an average of five hours, for 60-candle power; and where they employed compressed gas—when he said compressed gas, he meant high-pressure gas at about 8 inches—it was much cheaper. He did not wish to go through the paper in detail, though there was a lot that might be said. He would pass over a great deal in order to come to a point in reference to train lighting on which he set much value. Mr. Fowler had not dealt with train lighting; but he had alluded to the effect of it on platforms. For a great number of years, gas had been a most valuable agent for train lighting; but at the present time, as they all knew, it was under a cloud, because certain gentlemen of great authority had pointed out that in train wrecks it added something to the risks. He had examined the records of all the accidents to passenger trains reported upon by the Board of Trade within the last 26 years; and the result was that out of 1478 accidents, there had been 14 cases in which the wreckage had been involved in fire.

The President pointed out that the question of train lighting had been purposely avoided by the author; and it was a little outside the discussion at present. They would, however, be pleased to hear what Mr. Hughes had to say.

Mr. Hughes (continuing) said an examination of these 14 cases amounted to this—that in one instance the fire was due to a defective motor, in one it was owing to a lighted reading-lamp, in three cases the cause could not possibly be ascertained, in four instances it was due to gas, and in five it was originated by the fuel under the locomotive. So that the fires caused by gas amounted only to 0·27 per cent. of the total number of accidents. He was not taking sides one way or the other; but the facts he had mentioned should re-assure the British travelling public. The position of such a valuable lighting agent as gas should not be prejudiced. What they should go for was the prevention of accident; and if they succeeded in this, the secondary cause of risk would take care of itself. [Mr. Hughes then showed on the screen some photos of the lighting of the railway shops at Horwich, with arc lamps, as well as the interior of a saloon lit by incandescent gas. He also exhibited a diagram with reference to "Tantalum" and ordinary carbon filament lamps. This showed that the "Tantalum" lamp was much more economical, though the first cost was greater. The "Tantalum" lamps ran about 1200 hours, and only lost 3 or 4 candle power; whereas the filament lamps fell from 30 candles to 10.]

Mr. Mackworth Praed remarked that the subject under discussion was most interesting, and one upon which Mr. Fowler must have bestowed an infinity of trouble and time. There were, however, one or two paragraphs in the paper in which air gas was dealt with to which he (the speaker) took exception, as well as one with which he most heartily concurred. To take the latter first, the author said he believed that there was a future before petrol-fed lamps. This he (the speaker) entirely agreed with; but, most unfortunately, the author added that the time for their general adoption had not yet come. He wished to call the attention of the members to a plant for utilizing petrol [which was shown in operation at the meeting], which was the invention of Mr. John Gore, of Sutton; and he said that there were no doubt others of a similar kind. This particular machine, he said, Mr. Fowler evidently had not had an opportunity of testing. It was stated in the paper that the air was usually carburetted by passing it over or through the petrol; but in the machine before them neither the one thing nor the other was done. In the course of a description of the apparatus which Mr. Praed read to the members, it was pointed out that the petrol was atomized and sprayed on to the air, by which it was absorbed; and the mixture passed off as a fixed gas. Any small amount of petrol that might not be absorbed by the air, returned to the tank. New pipes should be put in for this system; and under no circumstances should pipes be employed that had been used for acetylene, as there was something about them that seemed to have a detrimental effect on air gas. The only difficulty which presented itself was the supply of petrol, which should always be of a specific gravity not greater than ·65 to ·85. Generally, however, one could get petrol of the desired quality. He referred to an installation fitted up at Pirbright Camp, and stated that for 56 lights and 5 bunsen burners for a hot-plate, the cost was £1 15s. per month, as against £4 estimated for oil to give an equal light and cooking facilities.

Mr. Henry Lea said in the early part of the paper there was a reference to a photometer for ascertaining what really was the amount of illumination obtained from the lights which were installed. Of course, he supposed most of them would think this was a reasonable way of testing what one was doing; but some years ago, when he wanted to go into this matter rather carefully, he found that no such thing as a photometer for the purpose was obtainable, because the demand for it, he was told, was so small that it was not worth while keeping it in stock. One was, however, made for him, but failed to work properly; and as it seemed so difficult to get what he wanted, he himself devised a photometer, which he found satisfactory, and which he had not patented. He would point out that the illumination of a room should not be measured on the floor. What people wanted to know was how many candle power of light there was at somewhere about desk or table level. Therefore he made his photometer about 3 feet high, so as to correspond to an ordinary table. It was a plain square box, with a top having a round hole through it, and a grease spot. A slider carried an electric lamp, properly calibrated to give a light of 1-candle power at a convenient voltage, which was easily ascertained by a volt-meter fastened on the photometer—the electricity being derived from two or three small storage cells. The slider and the lamp were attached to a cord running over a pulley; and by means of this cord, the lamp could be raised or lowered. A little projection on the back of the slider was opposite the centre-line of the filament lamp, and slid up and down a slot in the box. This opening, while the observation was being made, was closed by a shutter. It was very easy to stand about a yard off with the cord in one's hand, and pull it to and fro, until one got a balance of light on the grease spot. Then the cord was fixed, and the shutter opened; and one could look at the scale arranged at the side of the slot. This scale was calculated on the basis of the light varying inversely as the square of the distance, and enabled one to read off the illumination in candle-feet. The apparatus was quite portable; and in a very short time, one could make a number of observations with it. If it was desired to ascertain the effect of an angular ray of light, all that was necessary was to tilt the apparatus in the direction from which the light came; and one got a direct measurement of the angle of light.

Mr. Wainwright said the author had mentioned that a higher pressure than 8 or 10 inches was more efficient in some of the high-pressure gas installations; but he (the speaker) thought they would find this greater illumination was secured with a loss of efficiency economically. One important question to consider was the mantles. These added to the cost of high-pressure gas lighting if they broke very rapidly; but their life was increased by the use of anti-vibrators. Mr. Fowler had also mentioned the earlier types of water-power pressure-raising apparatus, using the town mains, and did not think much of them, as they required from 188 to 327 gallons per 1000 cubic feet of gas compressed. This had now been considerably reduced; and he had known tests made with Keith's machines which showed 170 gallons. Mr. Wainwright next drew attention to the same firm's devices for permitting the removal whenever necessary, without breakage, of the mantles, and for the proper adjustment of the gas and air. He thought that, without some such arrangement as this, the breakage of mantles was very considerable when, for any purpose, they had to be taken by an ordinary workman off the lamps. Comparing the cost of gas with electricity, he remarked that 100 electric lamps of 16-candle power, using 60 watts each, with electricity at only 1d. per unit, would cost about 6d. per hour; whereas 100 inverted gas-lamps of 45-candle power, consuming 1½ cubic feet each, with gas at 2s. 10d. per 1000 cubic feet, would cost 5·1d. per hour. That was to say, gas gave nearly three times the amount of illumination at about 85 per cent. of the cost of electricity, even when reckoned at as low as 1d. per unit.

Mr. F. W. Goodenough, on being called upon, remarked that he had not very much to say on the paper, but would first of all like to thank Mr. Fowler for his extremely valuable communication, which, as a gas lighting engineer, he (Mr. Goodenough) would

find most useful. It contained a great deal of information, founded absolutely throughout on practice. He was interested in Mr. Lea's photometer, and in his remark as to the necessity of not measuring the light on the floor-level. This always appeared to him (the speaker) to be a mistake; and he had taken 4 feet from the ground, as against Mr. Lea's 3 feet. He took it that the position where light was most usually required was between the floor level and a couple of feet above a man's head. Adopting the mean of this, they would arrive at the point where the light should be measured. Of course, the importance of this point came home to them when they considered the question of the height at which they should fix a light above the floor-level, and the efficiency of the light wherever it was placed. If they put an arc lamp 20 feet above the ground, and took it as being of 500-candle power, they had to divide this by the square of 17 to find the available light on the plane underneath; while if they put a 200-candle power lamp 12 feet high, they had only to divide by the square of 9. They would thus find that the 200-candle power lamp placed 12 feet high was considerably more effective than the arc lamp 20 feet high. Mr. Fowler, in referring to goods yards lighting, indeed, spoke of three-light incandescent gas-lamps of 150 to 200 candles as being practically interchangeable with arc lamps, which might be considered to be of 500-candle power; and it was undoubtedly the fact that, as they could put the incandescent gas-lamps nearer the ground, they were practically as effective as the arc lights. Mr. Fowler throughout his paper seemed to have got at the back of his mind that he wanted a big light a long distance away; and he must have been thinking all the time of the sun, in regard to which the element of cost had not to be considered. But in practice his paper showed that he found that a considerable number of lights placed only a moderate height above the place to be lighted was the most effective and economical means of illumination; and this was where it might be said that gas lighting had such a pull over electricity, because the smaller nominal candle power gave an equally effective light where it was wanted as did the nominally higher power arc lamps which had to be put up somewhere where they served to illuminate the heavens. Mr. Fowler mentioned as an advantage the convenience of being able to switch electric lights on and off; but he would like to point out that at Victoria Station (the contract for lighting which had been secured by the Gaslight and Coke Company), the whole of the gas-lights on the platform were switched on and off by means of control-taps, in just the same manner as was done with electricity. The lamps were on alternate controls, so that they could extinguish every second one by a single turn of the cock, and the remainder by a turn of another cock; and they could, of course, be lighted in the same way. They had thus arrived at the same stage of convenience as the electric light people. Mr. Fowler mentioned, with regard to a small country station, that he would like incandescent burners there; but as the light was only required during a few winter months, although the burners had always to be kept ready for use in case of emergency, flat-flame burners were generally used, to avoid the cost of keeping incandescent burners in order during the summer. A system that might be adopted was an incandescent burner made to fit on to an ordinary Bray flat-flame burner, by means of a sleeve. Directly this was put on, there was their incandescent burner; while in the summer it could be lifted off, and there would still be the flat-flame burner ready for sudden use. He agreed with Mr. Fowler that the Kern burner required more attention than a "C" burner, though it gave a somewhat higher efficiency. Mr. Fowler spoke of a higher efficiency per cubic foot when a pressure of 50 inches of water was used, instead of 8 or 10 inches, with the high-pressure system; but he said "the unit of light was raised higher than was usually required for railway purposes." At Victoria Station, his Company were using a pressure of 50 inches; and they were working with units of light from 175-candle power upwards with no material loss of efficiency as compared with larger burners.

Mr. FOWLER: How many candles do you get per cubic foot?

Mr. GOODENOUGH replied that with a 5-feet burner, they got about 33 to 35 candles per cubic foot; and with a 10-feet burner, from 38 to 40 candles. He had got as high as 45 candles per cubic foot; but this was rather a "freak" result, and from 38 to 40 candles was the normal reading. He thought Mr. Fowler would like to know that they could get down as low as 175 candles even at 50 inches pressure. The system was that adopted at Woolwich Arsenal—the Sale-Onslow. Mr. Fowler referred to a small type of inverted burner giving an economical light of 12 candles; but just afterwards he gave a table in which the smallest candle power was 25. He must have been under-rating the inverted burner when speaking of 12 candles, which would be an extremely low efficiency. He would like also to take exception to Mr. Fowler's statement that for the lighting of the offices, &c., of a station incandescent electric lamps were quite satisfactory, "as in many cases an 8-candle power electric lamp over a desk was all that was required." Any employer who expected his staff to work with a nominal 8-candle power lamp as the only source of light, was doing his best to blind his employees; and he believed that great destruction to eyesight was caused by using so-called 8-candle power lamps—probably giving a light of 5 candles—instead of having a well-diffused light of (say) 30 or 40 candles placed rather higher up to work by.

Mr. FOWLER, replying to the discussion, said he would like to make a few remarks with regard to what Mr. Trotter had stated at the last meeting. He questioned the use of oil-lamps, when the arc lamp was the most economical from a candle-hour standpoint. But, as Mr. Hughes had said, they had to deal with small units; and they did not want arc lamps at country stations. The most inefficient lamp used on a railway was a small signal lamp which gave 1-10th candle power; but at the same time it was undoubtedly one of the most economical lamps, because it gave all the light that was required. They paid at a high rate for a small light. The curves given in the paper were taken at 9 inches from the ground. He would like to join issue with Mr. Lea and Mr. Goodenough on this point. If they had the floor illuminated properly—or, say, 9 inches above it—then the lighting was all right elsewhere. He was, of course, speaking specially of the lighting of railway premises and workshops. Undoubtedly, the floor was the point one looked at first; and in any workshop there were often small things to be picked up and dealt with on the floor. The same applied to a railway station. There was one point apparently he did not make himself quite clear on in the paper. By horizontal and vertical illumination, he meant on horizontal and vertical planes; and when the horizontal was right on a railway, the vertical was also right in the majority of cases. The only exception he knew of was in the case of shunting-sidings where waggons passed quickly, and the numbers were chalked on the end. There they made special arrangements for illumination on the vertical plane, so as to throw a light on the ends of the waggons. Mr. Trotter now believed in patchiness for street lighting. This might possibly be all right for streets; but it was not, generally speaking, for a railway. The only case where light might be patchy was with points in sidings under some conditions. In this case—as Mr. Goodenough had stated, and as he had hoped he had made clear in his paper—a light of 100-candle power was quite sufficient; and therefore it was unnecessary to have 1000-candle power. It was on this point that gas had pushed electric light. At one time, there was nothing for use between the 16-candle power electric incandescent lamp and the high-power arc; whereas now there were very many intermediate types in use. He had not time to deal with his own photometer and Mr. Trotter's; but he should like to speak in appreciative terms of the latter. In connection with these portable photometers the question of weight was important; and Mr. Trotter had, he thought, made his even lighter than the amyl-acetate one which he (Mr. Fowler) used. In the paper he mentioned Sheffield Station as being one of the best-lighted stations on the system; and he had had some photographs taken which might interest the members. Since the paper was written, they had made considerable alteration in the lighting of one of their sheds by the use of high-pressure gas-lamps, with very satisfactory results. As to Mr. Praed's remarks about carburetted air, they had had a system working for about twelve months which gave better results than they had secured at the time the paper was written. He could assure Mr. Praed that the railway companies were wholly disinterested in this matter, and would watch with interest what was being done. He thought that probably the reason they got unsatisfactory results by passing carburetted air gas through acetylene pipes was that the latter were much smaller than were required even for ordinary gas, and to obtain a proper light from petrol gas it was necessary to have pipes that were larger in diameter. With regard to Mr. Wainwright's remarks about incandescent mantles, he thought when a skilled man looked after them there was no difficulty. They had every year a function at a hall situated a mile from the station at Derby, and they used mantles there, and then took them off again and placed them on burners at the station. Some time ago, the King went to one of his Company's stations, and they put up some special lamps for the purpose, which were not needed afterwards; and so the mantles were removed from them, and put on somewhere else, a long way off. The fragility of the mantle could be met to a certain extent by the carefulness of the man. He might mention that the water compressing plant which used over 300 gallons per 1000 cubic feet of gas compressed was very old. One of the troubles of plants driven in this way was the possibility of the water being cut off; and then the light would nearly go out. Mr. Goodenough was quite right in saying that he (Mr. Fowler) had the sun in his mind as being an ideal light; and for shop lighting, he thought that, with an expenditure of a little more gas, one could get more satisfactory results by having the lights high. Mr. Evered, in speaking of the Kitson light, said they had a device by means of which the lamp was fastened to a jib crane, and when the crane came along, it threw the lamp round; and then afterwards the lamp swung back again into position. But he (Mr. Fowler) did not think this was necessary. It was better to have the light higher up and permanently fixed, because what they wanted was a general illumination, and not the lighting of a particular point. He asked Mr. Goodenough how they switched the lights on and off at Victoria Station, because no method that he had tried had lasted for any time.

Mr. GOODENOUGH explained that they had an independent low-pressure service, and a mercurial seal on each down-rod, which automatically closed the gas-ways when the main-tap was turned off.

Mr. FOWLER (continuing) said he thought he had worked underneath an 8-candle power electric light; but this one had a reflector at the top, and he had not experienced any difficulty. But undoubtedly the question of lighting was one that grew. An American humorist had said that, whereas our grandfathers were satisfied with one candle in a room, our children would not be content unless they had an arc lamp over each shoulder.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Lecture on Flame Temperature.

The members of the London and Southern District Junior Gas Association turned up in considerable force—the audience numbered about fifty—at the Cripplegate Institute, E.C., last Wednesday, for the purpose of hearing a lecture by Mr. W. H. Y. WEBBER on "Flame Temperature in Its Practical Aspects." The chair was occupied by the President (Mr. W. Upton), who, in introducing the lecturer, said he did not know a subject on the technical side that was of greater importance than the one they were going to hear dealt with.

In his opening remarks, the speaker cautioned his hearers against wasting their money and time on old text-books, though he admitted that there was, of course, much that they must learn and have by them for reference which never grew out of date—such as arithmetic, mathematics, geometry, mensuration, and the tables of properties and constants appertaining thereto. But they should never buy encyclopedias or subscription books with tempting prospectuses, which were necessarily out of date before they were published. The newest of any text-books that they felt in need of, official publications, such as Blue-Books, the notifications of authorities like the Metropolitan Gas Referees, the Transactions of societies, and the Technical Press, would be found of greatest use to them. With even the latest and most expensive text-book, however, he pointed out that they must be prepared for the passing over of many things that they particularly wanted to know, and the stopping short of others precisely where the author's criticism would become helpful. He cited the seventeenth edition of Ganot's work on Physics, dated 1906, and edited by Professor A. W. Reinold, as affording an instance of this; the calculation of flame temperature not being dealt with there in the manner that a student buying an expensive text-book had a right to expect. "Yet," said Mr. Webber, "Professor Reinold must have known quite well that the question of the real temperature attainable by flaming combustion lies at the bottom of a large and highly important body of technic. Metallurgists want to know what to expect from the gaseous fuels at their command. Manufacturers of the harder kinds of porcelain and glass goods need the information. The whole body of incandescent gaslight practice depends upon the fact of high flame temperature. Lord Rayleigh, among others, pointed this out years ago. Yet the uninstructed, fumbling makers of this light, like Mr. A. W. Onslow, are fain to go on with their work in their own way, without the smallest help or guidance from the magnates of science."

Reference was then made to the researches of Professor Vivian B. Lewes and Professor Arthur Smithells. Mr. Webber remarked that Professor Lewes, in his lecture to the Institution of Gas Engineers on "Candles and Calories" in 1903, laid stress upon the fallaciousness of the idea that the temperature of the flame was governed by the calorific value of the gas. Professor Lewes stated that the temperature of the flame produced by the combustion of a sample of gas depended (1) upon the time in which this volume of gas was consumed, (2) upon the area in which the combustion took place, and (3) upon the amount of air needed for completing the combustion, and the specific heats of the products of combustion of the flame and the residual nitrogen from the air, which in their escape removed heat from the flame. This "affect," as it might be termed in philosophical language, of flame temperature, he concluded, was the important thing in incandescent gaslight production. "Professor Lewes," continued Mr. Webber, "described certain experiments showing for blue water gas, purified from CO_2, with a calorific value of 325 B.Th.U. net, a light efficiency in the Welsbach 'C' burner of 19·38 candles per cubic foot hourly consumption at 13-10ths pressure. The illuminating power of the light in this case was 158 candles for a consumption of 8·15 cubic feet per hour. Observe here the satisfaction of all the conditions previously laid down by Professor Lewes as governing flame temperature. We start with a particular size of substance to be heated by the flame—to wit, a 'C' mantle. If this mantle were heated as in the ordinary way by a flame of mixed town gas and air, the former having a calorific power of 540 B.Th.U., or thereabouts, and burned at the rate of 4 cubic feet per hour, which would just about fill it, the same average duty per cubic foot of gas might be expected—meaning, that the mantle would be at approximately the same temperature. The amount of air required for complete combustion would be nearly double. The high temperature attained by the water gas is therefore due to the comparatively smaller size of its flame. Professor Lewes puts the flame temperature of coal gas here at about 1660° C. (which is low); and quotes Blass for a water-gas flame temperature of 1775° C. It was also shown that a temperature sufficiently high to yield a brilliant light at 20-10ths pressure can be attained, by careful air regulation, with an exceptionally good quality of producer gas of 184 B.Th.U. net calorific power. But meanwhile others had been busy upon the problem of the connection between the calorific power of gases and their value for the production of incandescent light by the Welsbach mantle. Dr. Bunte, Dr. Colman, Mr. F. D. Marshall, and others, independently hit upon the same guiding principle—that within the ordinary range of differences in the calorific value of town gas, of various makes, the duty obtainable from the gas and a mantle is about the same—adjustment of the air supply being understood. Mr. W. R. Herring has also carried the same discovery to conclusive demonstration."

Coming to Professor Smithells' work, the lecturer referred to his address in 1905 to the Institution of Gas Engineers, on "The Temperature of Flames," in which was explained why the classical rule for calculating flame temperatures had no correspondence with the facts. Professor Smithells described how Bunsen made a shot at the problem, with results far from correct; and he proceeded to explain the phenomenon of dissociation, and most instructively indicated the part played by it in making mixed flames as thick as they were. That was to say, as he (Mr. Webber) understood him, it was due to the deferred combustion effect of dissociation that the flame of a Kern or a Mecker burner was not a mere filmy appearance at the zone of ignition, as would be the case if the mixed gases could burn all at once at the initial temperature of their combustion. Professor Smithells thought that flame temperature calculation could be carried out, but did not offer any examples; and the broad result of all the study he (Mr. Webber) had been able to devote to the problem was that he could not ascertain from its composition what degree of elevation of temperature to expect from the burning of a particular sample of combustible gas or mixture of gases, while on all sides he heard complaint of the want of this information.

By means of fine strips of wire, and some bunsen burners which were fitted up in the room, the lecturer next demonstrated the fact that the temperature of flames varied greatly in different parts; and he also quoted figures on this point. Taking a common laboratory bunsen flame, with an air adjustment, enabling the inner cone to be varied from the blue tint of under-aeration to the green of approaching back-lighting, Professor Lewes gave the following as the measured flame temperatures:—

	With Blue Inner Cone.	With Greenish Inner Cone.
At tip of inner cone	1994° Fahr.	2867° Fahr.
Centre of outer cone	2791° ,,	2966° ,,
Side of outer cone, level with tip of inner cone	2431° ,,	2752° ,,
Proportion of air added to the volume of gas	2·27	3·37

Tests made at the National Physical Laboratory on the same subject showed—

Temp. of Centre of Flame at	Ordinary Bunsen.	Mecker Bunsen.
2 mm.	100° C. (212° Fahr.)	1520° C. (2768° Fahr.)
10 ,,	100 ,, (,,)	1470 ,, (2646 ,,)
20 ,,	150 ,, (302 ,,)	1460 ,, (2596 ,,)
40 ,,	500 ,, (932 ,,)	,, ,, (,, ,,)
60 ,,	1100 ,, (2020 ,,)	1470 ,, (2646 ,,)
80 ,,	1350 ,, (2462 ,,)	1430 ,, (2351 ,,)

Pointing out that the hottest part of the flame in ordinary bunsen burners was in the solid region over the inner cone, while the Mecker flame was solid, and hottest at the bottom, Mr. Webber said this went to support the "dissociation" explanation. He remarked that other observers gave different maxima for these bunsen flame temperatures, and then proceeded to consider the question of the temperature of a mantle as compared with that of the flame in which it was plunged. Assuming that the mantle possessed a sensibly greater heat than the gas-flame, he asked whether this was due to the catalytic action of the mantle (as Professor Lewes once thought), or whether it was caused by the purely mechanical effect of the meshes of the mantle in completing the mixture of air and gas, presenting the mixture from inside to the rapid action of the outside or secondary air in such a fine state of division as to secure the best possible final combination. He himself believed there was much in the latter explanation, and that those who studied inverted incandescent lights and their activating bunsen flames would agree that the mantle did something else besides glowing. Returning to the lecture of Professor Smithells, Mr. Webber remarked that one of the valuable observations contained in it concerned the relationship between flame volume and flame temperature. With gas burning at a fixed rate, the smaller the volume of the flame, the higher must be its temperature. Professor Smithells explained that the way to get a small flame was to have it mixed primarily with the largest possible portion of the air it required for its combustion. This effect, said Mr. Webber, was strikingly exemplified by the Mecker burner. The Kern burner also exhibited compression of the flame; while its formation was specially moulded to the object for which it was made. The Bray and Sugg mantle-burners were designed somewhat on the same lines. Professor Harold B. Dixon pointed in the same direction in 1904, when he said that "the burning of a highly explosive gas mixture is one of the best means of developing light from gas;" the light-giving power, of course, being synonymous with high-flame temperature.

Continuing on this branch of his subject, the lecturer remarked: The question of getting as much primary air as possible into the burning mixture was worked at by the late Mr. Frank Livesey, and by Mr. Walter Grafton, your ex-President, and it underlies the "Selas" system of intensified lighting. In point of fact, what all the high-pressure incandescent gas lighting systems now before the world do, is nothing more or less than make the best mixture of gas and air possible, and drive the flame through the mantle at a high velocity. There is no actual pressure within the mantle; the pressure of the gas in the pipes being translated by the injector into velocity. This means, according to Professor Lewes's formula, burning more gas in the time and space, which is one way of raising the flame temperature, and so producing

more brilliant incandescence. The degree of elevation of temperature attainable by this method depends upon several factors. How far the pace can be profitably forced, having regard to economical considerations, is another question again. Some tell us that, in the general way, an intensity of incandescence corresponding to a supply pressure of from 15 to 17 inches of water is enough. Other practitioners prefer to work at 54 inches pressure, which means double-wove mantles. So far as I know, this is the maximum for lighting burners. Mr. Onslow has kindly made, at my request, some comparative observations by means of the Féry pyrometer, of the temperature of incandescent mantles. From these, it appears that, as might be expected, the thermal radiation rises with the luminous intensity.

RADIANT TEMPERATURE OF INCANDESCENT GAS-MANTLES, IN DEGREES CENTIGRADE.

"C" Burner with Chimney giving 60-Candle Power. [Length of Mantle from Loop to Burner, 3⅛ Inches.]		Same Mantle *without* Chimney, 50-Candle Power.
Temperature at the top	480 to 500	560
,, 1⅛ inches from the top,	490	560
,, 2⅛ ,, ,,	470	610
,, 2⅝ ,, ,,	450	570
,, 3⅛ ,, ,,	400	520

600-Candle Power High-Pressure Burner. High-Pressure Gas-Mantle with no Glass Protection. [Length of Mantle from Loop to Burner, 4¾ Inches.]		Same Mantle under Different Illuminating Power. 900-Candle Power.	400-Candle Power.
Temperature at top of mantle	730	700	675
,, 1¼ inches from the top	735	705	680
,, 2½ ,, ,,	740	710	685
,, 3¾ ,, ,,	745	720	690
,, 4¾ ,, ,,	755	730	705

High-Pressure 1000-*Candle Power Burner.*

[Length of mantle, 5⅝ inches from loop to burner.]

1000-Candle Power.		500-Candle Power. First Test.	5 Mins. after First Test.	800 C.P.
Temperature at top of mantle	710	690	690	690
,, 1½ inches from top.	720	710	690	695
,, 3 ,, ,,	730	720	700	790
,, 4½ ,, ,,	725	720	705	705
,, 5⅝ ,, ,,	720	715	700	700

High-Pressure 250-*Candle Power Burner.*

[Length of mantle, 3½ inches.]

265-Candle Power.		250-Candle Power. First Test.	After 5 Min.	200 C.P.
Temperature at top of mantle	630	630	630	610
,, 1 inch from top	630	630	630	610
,, 2 inches ,,	630	630	630	610
,, 3 ,, ,,	645	650	645	620
,, 3½ ,, ,,	650	645	635	625

The uniformity of the 1000-candle power mantle temperature may be due to the mantle tapering from the bottom to a narrow neck; whereas the 600-candle power mantle is almost the same diameter throughout the length from 4¾ inches to within 1 inch of the top. This looks as if the two radiations, thermal and luminous, in the case of all the high-pressure mantles are of about the same proportions; the greater illuminating powers being due to the larger mantles of the more powerful burners. But the difference of the proportionate thermal radiation between the Welsbach "C" mantle and the intensified mantles is marked. I draw your attention to the remarkable fact that, though the local temperature at the mantles in these burners is higher than the melting point of platinum, which is 1775° C., the pyrometer only finds a temperature inferior to this by about 1100° C. This circumstance alone warns us that the measurement of flame temperature is not a simple task.

But this is not the whole of the story. Indeed, it is but the preface to the volume that has yet to be written upon the enthralling subject of the practical working aspect of flame temperature. The intensity of flame temperature may not be easily ascertainable by the classical method of calculation from the calorific value and the weight and specific heat of the combustion products, or by actual measurement; but it is very greatly affected by the proportion of incombustibles intruded upon it. The presence of nitrogen cannot be helped if we must burn our gas with air; but if oxygen were cheap enough, as Professor Dixon has remarked, it would be easy to increase the temperature of the flame by 500° or 600° Fahr.; and as radiation increases as the fourth power of the absolute temperature, the light duty of the same mantles that are now in use would probably be raised to 100 candles or more per cubic foot. On the other hand, admixture of an impurity having a high specific heat, as CO_2, is fatal to the attainment of the highest temperatures.

Another important conclusion to be drawn from this survey of the means of producing high-flame temperatures is that of the futility of the regenerative principle for this purpose. The effect of heating a gas is to dilate it, which is tantamount to diluting it. In the case of the Siemens type of regenerative burners, which worked at very low pressure, and had a luminous flame, the increased radiation due to raising the temperature was accompanied by extension of the radiating area of the flame. This is impossible with an incandescent mantle, which is of fixed dimensions; so that if the supply of gas and air is rendered bulkier by preliminary heating, regenerative or otherwise, the effect of the mixture in passing through the meshes of the mantle must be so much weaker that any possible gain by one way is more than neutralized by the loss on the other. Indeed, in the interest of concentrated action on the mantle, it would be better to condense the air and gas by cooling, than expand them by heating.

Mr. Webber concluded his lecture with a few remarks on the question of flame temperature as applied to heating by gaseous fuel. He said that the next resource to the weak and uncertain producer gas was plain water gas, which, though its flame temperature was high, was troublesome to make and dangerous to distribute. There remained, therefore, ordinary town gas, as the gaseous fuel of unexceptionable utility for most industrial purposes demanding an intense, rapid, and localized heat. For this use a higher gas pressure than anything employed for lighting was found advantageous. Coal gas averaging about 540 B.Th.U. net calorific power, with a fire-brick lined cupola-shaped furnace, worked wonders, for instance, in rapid steel annealing at a pressure going up to 100 inches. This was a matter of flame temperature—which, however, had not yet been measured. Consequently, no man knew precisely, or even approximately, what town gas would ultimately do for the service of man.

A vote of thanks to the lecturer was accorded with acclamation, on the proposition of the President, who said that what they had heard was most interesting. Mr. H. Rothwell seconded the vote; saying they all appreciated Mr. Webber's kindness in devoting, as he had done, his time and energies to the Association.

The President, after inviting the members to make any remarks or ask any questions that they might wish to, said that there were one or two points arising out of the lecture that had struck him. Mr. Webber had shown them an inverted burner in operation, and mentioned that with it the object was to keep the shaft cool. He (the President) had not particularly tested the burner exhibited; but he had a good many other types, and had noticed that the burners, after they had been lit for perhaps a minute or two, would most noticeably increase in light-giving power. Another point was that there was a constant tendency in their business for the units of light to become larger and still larger. Up to the present these had been obtained by grouping several burners in a lamp; but the demand for more light would continue, and he wished to know whether the existing system of grouping would be the correct one to adopt, or whether there were to be larger mantles and burners. This was a matter to be thought over; and as it involved the question that had just been dealt with, the lecture was most opportune. If they had very large units, they might come up against the same trouble as the electricians, with their several thousand candle power (reputed) lights, and have to soften them down considerably. Mr. Webber said he would answer the first point at once. He thought the effect the President spoke of—assuming it did exist—was due to the fact that the inverted burners were adjusted to what would happen when they had been lit for two or three minutes, rather than to what would occur directly they were put in use. Of course, they must get a little hotter in use; and if they were made to be perfectly right when cold, they would not be so when hot. Therefore he thought they were arranged to be not quite right when first lit up. The proper shading of inverted lamps was not always understood. The globes should be more deeply coloured at the bottom than in the other parts, so as to throw out more light towards the top. He had seen it stated that the inverted lights could not be turned down; but they could be, to a very considerable extent. Mr. J. Hewitt also referred to the President's question, and asked Mr. Webber whether he considered that the effect of the heat on the nipple had anything to do with the increased light given by inverted burners after some two or three minutes' burning. Even an ordinary upright Kern burner, he said, consumed a different quantity of gas with a cold nipple from what it did with a hot one—that was, if the nipple was made of brass. He believed steatite was now being used in some cases. Probably this difference would have an effect on the mixture, and produce an increased illuminating value. Mr. Webber remarked that, if there was any alteration, he thought it was allowed for by the makers. The nipples were very carefully manufactured to the one-thousandth of an inch gauge.

Among the other speakers was Mr. F. Ainsworth, who said he thought the lecture would be the means of helping a good many of them to go more thoroughly into the matter dealt with. He asked whether the mantle had not more to do with the increase of light after a burner had been going for a time. Then with regard to the solid flame and the cone flame, which was best, and likely to consume the least gas, in rendering the mantles thoroughly incandescent? What pressure did Mr. Webber think was best for bunsen atmospheric burners of various types if used in gas-fires? There were different views with regard to the pressure of gas for heating as well as for incandescent lighting. Mr. E. W. Eldred said that he had seen an inverted burner with an entirely closed globe; and he had been asked how it was that this burner was able to burn satisfactorily without assistance—apparently taking all it needed from the air-adjuster. He asked what was the best position for the air-inlet. As to the nipple question, he did not think the heating was sufficient to cause any alteration in the gas consumption. He believed the smaller consumption was due to the expansion of the gas and heated air going through the nipple. It was not owing to the lessening of the hole in the nipple. Mr. L. F. Tooth said that Mr. Webber had made some remark as to the preheating of gas, and had stated

that the lighting efficiency was thereby lessened. He (Mr. Tooth), however, found that it was increased, providing the size of the nipple and the mixing-tube was increased. He had made some tests with preheated gas, which showed that a cold Kern burner with cold gas passed 12½ per cent. more than with preheated gas. As to turning the inverted burner down, this could be done with a single unit or a single burner; but with church lighting there might not be a uniform pressure over the whole building, which was the cause of burners flashing-back, carbonizing, &c. With reference to the flame of an inverted burner being somewhat smaller at the commencement of lighting, it seemed to him that this was caused by the velocity of the gas not having drawn in sufficient air to fill the chamber. Mr. W. J. Liberty asked at what stage between an ordinary high pressure of (say) 15 inches and one of 50 inches or more would it be necessary to increase the strength of the mantles from single wove to double wove.

The next speaker was Mr. Walter Grafton, who said he would like to make a few remarks upon one or two points raised by the members. As to why an inverted burner gave a better result after a few minutes' burning, Mr. Tooth was right to a very large extent. The rate of gas was nearly the same through the orifice in a properly constructed burner; but the quantity of air was lessened. Therefore in cases where the gas was not wholly coal gas, but a mixed gas—particularly carburetted water gas—it was necessary to have a sleeve, so as to cut off a portion of the air. It was only by this means that they could secure a full-sized flame. Or on first lighting the burner with the air-adjuster in the position as used on a previous occasion, the gas should be turned on to give not quite the best result; but in two or three minutes the full power of the light would be obtained—clearly showing that the volume of air was reduced by the heating of the burner. As to whether a burner would pass more gas when hot or cold, he might say that it would pass from 5 to 15 per cent. more when cold. When they had a flame burning immediately at the outlet of a burner, there was a retardation. An inverted burner with an entirely closed globe and with air only primarily supplied to it would not burn for very long; a supply of air outside the mantle was essential to obtain the best results. The secondary air supply came in above the globe. In properly adjusted burners, any pressure over 8 inches caused the efficiency per cubic foot to gradually become less, and also the life of the mantle, which must be taken into account when supplying gas at high pressure.

In his reply, Mr. Webber remarked that Mr. Grafton had very kindly answered several of the knottiest questions. He was interested in what Mr. Grafton had said about the different flow of gas from burners when they were alight and when they were out of use and cold; and he asked whether he thought that it would apply also to the incandescent burner. Mr. Grafton replied that he had measured the quantity with flat-flame burners, both single and double hole; and the same thing would apply to inverted burners. And since there was less gas, there was also less exhaust or suction; and consequently less air was drawn into the bunsen tube to blend with the gas, producing thereby a larger flame and better illumination. Mr. Webber (continuing) said that the pressure of the gas always remained the same to an inverted burner; but it was a different thing with the air, and so the temperature of the tube had a good deal to do with the matter. As to the best pressure for fires, no doubt this would be a very "ticklish" question in the near future. He did not think they had yet bottomed the construction of the gas-fire; and what sort of flame, and what pressure, would eventually prove to be the best, were, he thought, subjects that they had not really begun to consider. With regard to single and double mantles, he believed Sugg's light at from 15 to 17 inches pressure had a single mantle; and the Sale-Onslow at some 50 inches, and the "Millennium" lamp at the same pressure, a double one. There was, however, a big gap between these figures. The strength of the mantle was required to resist the friction of the gas passing through the meshes, as much as the intensified heat. Some people thought that from 15 to 20 inches was quite sufficient pressure for all practical purposes; while others believed in a higher pressure. There was no doubt that they must have the most intense radiant that they could get. He did not know the inverted burner with the closed globe. The best place for the injector was as far from the spot where the gas was burnt as they could reasonably get it. He did not know anything about preheated gas; it was not a commercial article. No method that involved the systematic preheating of gas had ever succeeded. The regenerative system, of course, was more a case of heating the air than the gas—it was about six to one.

"Departmental Decisions."—We have received from Mr. S. Edgecumbe Rogers the issue of the above-named work for the quarter ending December last. It is the fifth of the series, and contains altogether 142 decisions by the Board of Education, the Home Office, the Local Government Board, the Board of Trade, the Post Office, the Registrar-General's Office, and the Treasury; those of the Local Government Board being the most numerous. They are all numbered, so as to make them easy for reference; and, inasmuch as they are not only legal interpretations of law by the departments concerned, but form precedents which govern similar cases wherever they occur, the book should be found useful by all engaged in the administration of local government.

NOTES ON INDIRECT ILLUMINATION.

A brief note appeared in a recent issue of the "Journal für Gasbeleuchtung," from the pen of Dr. E. Schilling, of Munich, discussing some figures given a short time before by Professor L. Weber, of Kiel, in the "Zeitschrift für Beleuchtungswesen," relating to the illumination in a room experimentally provided with indirect lighting from incandescent gas-burners, and also dealing with some figures given by Dr. Reibmayr, of Innsbruck, on the subject of the light in several rooms illuminated with electric glow lamps and incandescent gas-burners respectively.

Professor Weber's measurements were made in a small furnished room in the Physical Institute belonging to the firm of Julius Hardt, of Hamburg, which was 19 ft. long by 14 ft. 7 in. wide by 13 ft. 7 in. high, fitted with a double lamp supported 2 feet below the centre of the whitewashed ceiling. The lamp comprised two Hardt gas-burners which developed 105·5 and 130·5 horizontal candle power, from a consumption of 5·5 and 6 cubic feet per hour; the total light being thus 236-candle power for a consumption of 11·5 cubic feet. The measurements of the illumination were made on surfaces 3 ft. 7 in. above the floor; the surfaces being sometimes horizontal and sometimes vertical. The results obtained are given in Table I.

TABLE I.

—	Under the Light.		In the Corners.	
	Horizontal Surface.	Vertical Surface.	Horizontal Surface.	Vertical Surface.
Without reflector. . . .	2·50	0·43	2·22	0·95
White enamelled reflector pointing upwards . . .	2·76	0·46	1·95	0·83
Do. provided with sectors of mirror glass. . . .	3·18	..	2·32	..

The author's figures have been converted from metric into British data, on the basis that 11 Hefners are equal to 10-candle power, and that 1 Lux is equal to 0·0845 candle-foot.

In discussing the results, Professor Weber remarked that the reflector which is necessarily employed under the naked lamp when the indirect system of lighting is adopted, by no means reduces the average illumination, but actually increases it. This is due to the fact that a large portion of the unshaded light from the lamps would pass directly to the dark floor and lower parts of the walls, where it would be absorbed; whereas the white reflector throws the rays upon the white ceiling, whence they are reflected, reinforcing the light that naturally proceeds downwards.

It will be seen that, when the white enamelled reflector was employed, the average horizontal illumination was 2·52 candle-feet for a consumption of 11·5 cubic feet of gas per hour, in a room having a floor surface of 300 square feet. Hence per square foot of floor surface an illumination equal to 2·52 candle-feet at a distance of 3 ft. 7 in. above the floor was afforded by the development of 0·786 candle power from 0·0386 cubic foot of gas. Professor Weber proceeds to compare the cost of the illumination thus obtained from gas with the consumption of electricity in Tantalum lamps, such as were used in Müller's experiments in the Bremen Technical Institute, in a room having the walls white all over. Mülier found the current consumed in the provision of an illumination equal to 2·52 candle-feet to be 1·235 watt-hours per square foot; whence, taking gas at 5s. 6d. per 1000 cubic feet, and current at 6d. per B.T.U., the cost of the electric light was 2·8 times that of gas lighting.

Professor Weber also referred to the experiments that were carried out in the Technical High School at Munich two years ago, and to the conclusion that his own tests would make the cost of gas lighting 2·5 times as high as was found to be the case in Munich. As a matter of fact, however, the Munich results showed that illumination equal to 2·52 candle-feet could be obtained from a consumption of 0·0427 cubic foot of gas per square foot of floor surface—a result which, in spite of the entirely different conditions during the experiments, is sensibly identical with Professor Weber's own figures. It is also worth noticing that the Munich results have been substantiated by Professor Roth, of Zurich, as well as by Professor Weber himself; and therefore it may be confidently said that illumination obtained from Tantalum lamps is 2·8 times as expensive as indirect illumination with incandescent gas.

Some interesting experiments have also been carried out by Dr. Reibmayr upon the illumination present in rooms of various sizes provided with either gas-burners, or electric glow lamps, and lighted either directly or indirectly. The electric lamps were surrounded with egg-shaped shades of translucent ribbed glass, and were supported close under the ceilings symmetrically in respect of the rooms. The measurements of the illumination were made at the level of the desks, which in certain rooms were arranged in tiers. The glow lamps were of two nominal sizes, "16-candle power" and "32-candle power" respectively. The details of Dr. Reibmayr's work are recorded in Table II. Unfortunately, the amount of current consumed during the tests was not noted. The figures relating to the loss of light when the

Table II.

Room.	Number of Lights.	Illumination in Candle-Feet.			Ratio of Minimum to Maximum Illumination.	Percentage Loss of Light through Shadows.		
		Mean.	Max.	Min.		Mean.	Max.	Min.
Laboratory (730 sq. ft. by 13 ft. 6 in. high)—								
(*a*) Ceiling lights of 32-candle power glow lamps	12	2·91	3·28	2·20	67	9·8	33·0	4·0
(*b*) ,, ,, 10 ,, ,, ,, ...	12	1·15	1·34	0·95	70	..	..	..
(*c*) Indirect lighting with 32 ,, ,, ,, ...	12	2·17	2·49	1·82	72	9·1	27·3	1·5
(*d*) Cluster ,, ,, 16 ,, ,, ,, ...	8	1·15	2·24	0·59	27	23·9	67·1	10·0
Private room with dark wainscoted walls (386 sq. ft. by 11 ft. 6 in. high).	1 of 46 c.p. 1 of 29 c.p.	1·11	1·93	0·38	20	43·5	..	..
Indirect lighting by Welsbach burners—								
(1) Small class-room (550 sq. ft. by 12 ft. 2 in. high)	6	2·69	3·82	1·77	45	10·7	17·5	3·9
(2) Large ,, ,, (970 ,, ,, 12 ft. 2 in. ,,)	12	2·02	2·61	1·37	53	12·5	15·9	5·3
(3) Room for drawing class (1020 sq. ft. by 12 ft. 2 in. high) . .	20	2·70	3·56	1·52	43	17·3	29·0	2·5

indirect system is employed, owing to the longer distance the rays have to travel and the absorption by the walls, is much smaller than in the case of the ceiling lamps. On an average, the illumination values are reduced in this way by 31·1 per cent. The direct ceiling lights might be expected to yield somewhat darker shadows; but actually they are not inferior to the indirect lights either in distribution or in the matter of casting shadows.

Dr. Reibmayr has drawn the following conclusions from his own investigations: Ceiling lamps give a light which answers all the hygienic requirements of interior illumination, more especially for schools, lecture-halls, and drawing-class rooms. They yield a perfectly satisfactory illuminating effect from the candle power developed; and, particularly when electric glow lamps are used fed with current from a large generating station, the light is very constant. The ceiling lamps afford a light which is certainly not less efficiently distributed than the illumination from indirect lights; and they do not expose the eyes to luminous objects of excessive brilliancy. The loss of light through the formation of shadows is insignificant; and since the shadows do not possess sharp edges, they are not annoying to the occupants of the room. The high situation of the lights prevents the occupants from being dazzled or inconvenienced by the radiant heat—the light sources, indeed, being well above the line of vision. Contamination of the air and production of much heat are absent in the case of electric glow lamps, which have also the advantage of being easily and quickly switched on and off. As the light sources are numerous and small, the illuminating effect is elegant. Dr. Reibmayr also adds that, in his opinion, frequent distempering of the ceiling in pure white is not so necessary when high direct lights are employed as when the system of illumination is indirect. This economy and the small quantity of candle power necessary to afford the requisite illumination, help to reduce the high cost of the glow lamps.

Dr. Schilling concludes his article by saying that it would be most interesting if figures were given by Dr. Reibmayr bearing out his assertions relating to the costs of the two methods of illumination investigated by him. As mentioned above, Professor Weber showed that indirect illumination from gas was 31·1 per cent. cheaper than from Tantalum lamps; so that direct electric illumination should be always about twice as expensive as indirect illumination from incandescent gas-burners.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District.

A Quarterly Meeting of the Eastern District Section of the Association was held in Heriot-Watt College, Edinburgh, on Saturday afternoon—Mr. W. Brown (Lasswade), the President, in the chair.

The President said that, as this was the first opportunity they had had of seeing one another in the present year, he begged to express the hope that they, as members of the Scottish Junior Gas Association, might aspire to greater things in 1907 than they attained to in 1906. They could not stand still, and he thought he was safe in saying that those who made it a practice to attend the meetings reaped the benefit of hearing other views than their own as to how things should be done.

The business was then proceeded with.

Mr. H. Rule (Falkirk) read the following paper on

STOKING MACHINERY AT THE FALKIRK GAS-WORKS.

The advent of any new form of stoking machinery is sure to interest those who have the management of medium or large sized gas-works; and it is with pleasure, at the request of your President, that I now come before you with a description of the stoking machinery used at Falkirk. Before describing the machinery itself, and for the benefit of those who have not seen the works at Falkirk, I might mention that our carbonizing plant consists of 20-feet through retorts, eight in the oven, and each oven heated by a regenerative furnace situated on one side of the bench only. By this arrangement the whole operation of charging and discharging retorts is done from one side of the retort-house, by the projector type of charging and the pusher type of discharging machines; the hot-coke conveyor being on the side opposite that of the stoking-machines. This principle of working, although not so general in Scotland as in England, has proved with us to be a very convenient and economical method of carbonizing. The stoking-machines are, as is well known, the first of their respective kinds made by Messrs. R. Dempster and Sons, Limited, of Elland, Yorks. [Illustrated descriptions of these machines have already appeared in the "Journal." See Nov. 22, 1904, p. 608; May 16, 1905, p. 429; Oct. 10, 1905, p. 114; Feb. 6, 1906, p. 356; April 17, 1906, p. 162; May 15, 1906, p. 443.]

The charging-machine (Toogood's patent) consists of eight steel plates loosely pivoted to a central shaft, and having variable speed automatically imparted to each plate as it revolves; being slower at the inlet—viz., about 400 feet per minute—and gradually accelerated until it approaches the maximum of 2000 feet per minute at the outlet. The action is thus directly comparable to a sling gathering the coal at a comparatively slow rate of speed, and ejecting it at a velocity sufficient to charge the 20-feet through retort. The machine when charging a retort with coal of an average quality revolves at a speed of 70 to 40 revolutions per minute—that is to say, it only takes about 50 revolutions of the machine to completely charge the retort. This is, of course, brought about by the motion imparted to the blades. The outcome of this slow rate is that the wear and tear on the internal mechanism is reduced to a minimum. The machine has already dealt with about 17,000 tons of coal, or 65,000 charges. The wear and tear on the original parts has been quite negligible; and the machine is able to do a considerable amount of work yet. The blades of the charger are 7-16ths inch thick, and are provided with tips 4 inches broad and ¼ inch thick. These latter serve a very useful purpose. They prevent the blades bending should (say) a piece of wood, iron, or any other foreign substance get among the coal by accident, and being of much thinner material they will give way before the blades themselves. The attendant examines the tips frequently, and it is only the work of a few minutes to substitute a new one. The cost of a tip is 4d.

At the top of the charging-machine is a hopper, which holds 5 tons of coal. By means of a lever working a sliding door, the amount of coal for each charge is allowed to drop into the weighing-hopper, and at the same time the weight is registered on the dial in front of the machine. The opening of the bottom door of the weighing-hopper, by means of another lever, allows the coal to drop into a small belt conveyor, whence it is automatically fed into the machine itself. This feed conveyor is driven direct from the charger, and is always proportioned to the speed of the machine. Therefore, no matter whether the coal is wet or dry, large or small, it passes on at a regular preconceived rate of flow to the machine. Owing to the 5 tons of coal which the machine carries, the total weight is naturally heavier than would have been the case had continuous bunkers been installed; and, therefore the current absorbed in continually traversing will naturally be a little more. The current consumed for charging, discharging, traversing, and hoisting to the various tiers of retorts works out at 0·63 unit per ton of coal carbonized, which at 1¼d. per unit (the price we pay the Corporation) works out at 0·78d per ton of coal carbonized. Our total cost for electricity for coal and coke handling and stoking is 3·4d. per ton. This item (cost of current) could, in my opinion, be considerably improved by the use of a gas-engine and dynamo, and generating the current ourselves, as the price of gas would then only be 1s. 6d. per 1000 cubic feet; being the cost of production into our holders.

The charger is driven by a variable-speed shunt-wound motor, having a three to one range of speed. This will drive the machines at any speed at will, from 32 to 96 revolutions per minute. These speeds are found ample to deal with any coal, from 3½-inch cube downwards. The whole of these speeds are obtained by means of the controller. To charge a retort, the stoker moves his controller handle to the speed required, and admits coal by opening the outlet from the weighing-hopper, after having weighed the charge. As the coal passes into the retort, he gradually brings the handle back, and so reduces the speed. The operation is quite simple, and any weight of coal (from 5 to 8 cwt.) can be put in a 20-feet retort, so that a heavier or lighter charge can be worked according to the heats on the bench. There is a separate 8 H.P. motor, of the same type as that previously mentioned, for traversing and hoisting the machine.

The discharging-machine (Dempster and Ordish's patent) is of the telescopic ram type; and, I might say, it is entirely new and novel, inasmuch as the ram is actuated by means of wire ropes,

by which the tubes advance and recede in arithmetical progression. This allows the inner or small diameter ram to have the maximum support in its neighbour until the coke is discharged. The main object of the makers is, I believe, to couple the points of merit of a hydraulic ram with the facilities offered by the application of the arrangement of wire ropes. By the means they adopt, the cooling effect of the water is retained, while the difficulty found with the hydraulic machine, due to pressure in keeping tight packings in the hot retort, is entirely avoided. The machine consists of a framing fitted with steel travelling wheels for running on the same rails as the charging-machine, and is fitted with a separate motor and drum for actuating it, which are independent of the ram gear. On the four verticals forming the frame are cast-steel racks, engaged by pinions carried from the rising and falling frame, on which are also carried the motor and gearing for actuating the ram. The ram itself, as before mentioned, consists of a solid shaft, 2¾ inches in diameter, and a tube, fitted with a water-box (the tube and box being completely filled with water), also two carriages and wheels for running in the channels forming the frame of the ram.

The arrangement of the ropes for actuating the ram (supposing this to be closed) is as follows: The centre rope upon the ram is attached to the back end of the solid shaft, then brought over the centre wheel in the water-box, and the other end secured to the rising and falling frame. The second rope, for extending the ram, has one end fixed in the front casing of the large tube, then goes round the small wheel at the back end of the solid first length, then round the small pulleys in the casing in front of the large tube, back over the side wheel in the water-box, and finally to the large winding-drum. The other two ropes, which are for closing and pulling the ram back, are secured to one of the carriages on the large tubes and the wheels on the back end of the ram framing, and then on to the small winding-drums. When the rams start to open or extend, the rope on the large drum is wound in, and at the same time the two pulling-back ropes unwind off the drum; the first-mentioned rope only acting as a ratio or check rope in order to prevent the shaft or inner ram being travelled independently of the large tube. The ratio of the drums, I might mention, is 3 : 1—the large drum is 18 inches, and the two small drums for pulling back the ropes are 6 inches in diameter.

The motor for working the drums, also for lowering and raising the rams to the various tiers of retorts, is a series-wound motor with electric brake; and the whole of the motions, except for the travelling of the machine, are derived from the one reversing controller, which is fixed on the underside, at the back end of the frame of the ram. To prevent any liability of the attendant not stopping the ram at the end of its back or forward stroke, the controller is fitted with a spur pinion actuated by a rack on a sliding bar; the bar being traversed backwards and forwards by a striker fixed on the ram. Thus, at the end of each backward and forward stroke, the electric controller is put to the off position, locking it from being started in the wrong direction. The water-tank on the main frame is for spraying the ram and head after each discharge. The time occupied in the actual discharging of a 20-feet retort is less than half-a-minute.

Some of the principal features of this ram type I consider are: Lightness on the retorts, a water-filled ram without pressure, and general quietness and smoothness in working; the machine being practically noiseless except for the hum of the motor. With regard to a few advantages of the ram type of discharger, I am not able to give much that is new, as it has been well discussed and found proved by many engineers. The point of merit in the pusher type of the machine over others is that it allows of all coal being dealt with on the one side of the stack. This must be taken in conjunction with the projector charger, which, as previously explained, performs all the coal handling on the machine side, and allows of the most efficient subdivision of labour—thus tending to economy in working. At the same time the gritty coke dust is kept on the opposite side of the retort-bench, and away from the machinery, the motors, &c. Another advantage of the pusher type of machine is that there is no breaking-up of the coke; and with our coal in Scotland this is a very desirable feature. Dust is the chief enemy to the retort-house where so much electrical power is in use; and though the motors on all our machines are of the totally enclosed type, it has been found that the covers have not been sufficiently tight to keep out the very fine dust flying about. This has caused short-circuiting in the motors, and consequently trouble in working. We are, however, having special catches fitted on these covers, to permanently press them against the main framing of the motor; and this will, we hope, get over the difficulty. But for the stoking machinery our experience has proved electricity an extremely handy power.

At present we have eight stokers per shift, at 5s. per shift, in the retort-house, and these can produce, on an average, a million cubic feet of gas per 24 hours. They are distributed as follows: On the stoking-machine side of the retort-house, one man on the charging-machine, one on the discharging-machine, two lid men and pipe-jumpers, &c. On the coke-conveyor side, two lid men and pipe-jumpers, coke-conveyor attendants, and two producer cleaners, who also assist the other two.

[The paper was illustrated by diagrams.]

Discussion.

Mr. J. Dickson (Kelty) said he had not seen the Falkirk plant at work; but, after all, the results were the main thing to be looked to. Mr. Rule had given them some figures as to stoking and wages. So far as he (Mr. Dickson) could make out, the output amounted to about 41,000 cubic feet per man. He did not know what the make of gas per ton of coal was in Falkirk; but if they took, as an average, 9500 cubic feet, it would be about 105 tons of coal handled by the plant per day. This would come to 13·71d. per ton, which was a very good result. But he should like to know if this included everything—from the coal-waggon to the coke-bing, and whether it was the very best result to be obtained, being the winter result. Had they any idea yet as to how it would turn out in the summer?

Mr. Rule said he had not the exact figures with him; but those given did not include the whole cost from coal-waggon to coke-heap, only the cost in the retort-house.

Mr. J. W. Lill (Edinburgh) asked if it was found that the wire ropes wore well on the small pulleys, and also if the discharging shoot wore the bottom of the retorts.

Mr. J. Simpson (Inverkeithing) enquired if the men controlled the charging-machine so that no coal was thrown out at the far end of the retort.

Mr. J. R. Moyes (Edinburgh) asked if there had been any trouble in the matter of the renewal of the ropes.

The President expressed regret that members who were accustomed to stoking machinery had not taken the opportunity of discussing Mr. Rule's most interesting paper. What he had brought before them had proved very instructive; and while the paper might appeal to some more than to others, there was much in it that would be helpful to all. There were, perhaps, some things they would like to have heard more about—such as the saving effected by means of the machinery, and also whether it had affected the make of gas per ton. Those who were at the meeting of the North British Association last year would probably remember that Mr. Napier, of Alloa, said that the make per ton had increased since the introduction of the De Brouwer machine there. He would also like to know something as to the wear and tear of the retorts in connection with the sliding out and in of the discharger. He did not suppose that Mr. Rule would be in a position to tell them much as to the wear and tear of the machines, or about their upkeep. Time alone would do that. Those of them who had seen the machinery at work could not but admit that the coal was placed in a perfectly even layer throughout the whole length of the retort, and that the operator had the machine under entire control; also that the discharging-machine was perfect in its motion. One thing which much appealed to him was that the machinery for charging and discharging was on one side of the bench, while the hot-coke conveyor was on the other. This should certainly prove advantageous to the men. He thought, with Mr. Rule, that the cost of electricity could be considerably reduced by the introduction of a gas-engine and dynamo.

Mr. Rule, replying to the questions, said the eight stokers they had were in the retort-house alone. They had nothing to attend to but the 72 retorts. He might say the machines were not yet out of the guarantee of the makers; but so far as any wear and tear was concerned, there had been an alteration in connection with the ropes. They were now so arranged that the work each rope had to do was much better spread. Before, they had one rope drawing out the ram, and the other pulling it back again. Now, however, the duty of each rope was practically the same; and the result had been that the ropes did not show the slightest sign of wear. Nor did the retorts show any sign of wear through the ram. As a matter of fact, there was very little weight on the floor of the retort; and when the solid ram was out, it could be easily lifted. At the far end of the retort, before they charged, the stoker put in a stop, which prevented the coal being thrown out; then, when the charge was completed, the stop was taken out, and the coal lay at an angle at the end. Their make of gas per ton was 9400 cubic feet. They used no cannel or shale, but only splint and nuts. In the old works last year, their make per ton was 9250 cubic feet; but he had extended the length of time of the charge, and for the past week he had been getting 9700 cubic feet per ton. In the old place the work was of a different nature, and it would be difficult to say what the difference now was, as the stokers were not paid for unloading and breaking coal and taking the coke into the yard. There were separate men for attending to this. He was very pleased that the points which had been raised had been brought up, and he hoped he had answered them satisfactorily. He was sorry that circumstances had prevented him from going more fully into the subject.

Mr. J. T. Wight (Edinburgh) then delivered a lecture on

SUCTION GAS-PRODUCERS.

He explained, at the outset, that his lecture was not intended to be comprehensive, but merely to give a brief outline of the general principles involved in the construction and working of various suction gas-producers in use at the present day. These plants were, he said, regarded differently by different individuals—the power user looking at them from the £ *s. d.* point of view, and the gas engineer considering them in the light of a challenge from the engineering profession to go one better.

Before dealing with the different types of suction gas-producers now on the market, the lecturer considered briefly how the gas-engine and producer plant compared with the steam-engine in the matter of prime cost and consequent upkeep. Even in the matter of floor space, the advantage was, he said, very much in favour of the gas-engine—in fact, it required only about half the area needed by the steam-engine; so that at the outset they

had a considerable saving in ground and rental. Looking at the prime cost of the plants, the steam-engine, with boiler, piping, condenser, &c., would cost £1400, while the gas-engine and producer would involve an expenditure of £1410. But, including the cost of the necessary buildings, foundations, and settings, there was a sum of about £300 in favour of the gas-engine, even on a comparatively small unit. Without considering all the details, it could be seen at once that there would be an annual saving of £350 in favour of the gas-engine; or, all things considered, while the steam-engine cost ½d. per B.H.P. hour, the gas-engine would give the same for half the amount. The steam-engine only used 12 per cent. of the total fuel supplied to it, while the gas-engine used 20 per cent. He thought the arrangements which could give results such as these were well worthy of, at least, some little consideration by them.

The lecturer went on to say that as the operation of a suction gas-producer depends entirely on the working of the gas-engine, it might be advantageous to study what was going on in the gas-engine cylinder. The "Otto," or four-cycle engine was the one most frequently used. The term "four-cycle" had its origin in the method on which the engine worked. The complete cycle of operations might be divided into four distinct periods. The first stroke was called the suction or charging stroke; and during this period both gas and air valves were open, and consequently an explosive mixture of gas and air was drawn in behind the piston. On the return stroke, both valves were closed, and the mixture was compressed—its pressure rising. At the end of this stroke, which was called the "compression stroke," a timing-valve was opened, and the charge was put in communication with the hot tube, when an explosion took place, and the piston sped forward on its working stroke. On the return stroke, the exhaust was opened, and the products of combustion were swept out. It was this stroke that was the important one for a proper working of the suction producer, which, as its name implied, was operated by suction, provided for by the engine itself. All gas engineers must be aware that this producer had been evolved from the pressure gas-producer invented by Mr. J. Emerson Dowson in 1878. This invention was specially valuable on account of the impetus it gave to the evolution of the gas-engine in large units, resulting from the possibility of obtaining power gas cheaply. It had been gradually improved until to-day the engineer was able to offer the power user a plant, the trials and results of which seemed to augur well for its general introduction in the near future, even for quite small powers.

The lecturer then proceeded to narrate the history of invention in connection with suction gas-producers—giving detailed descriptions, illustrated by diagrams shown on the screen, of the Campbell, Crossley, Daniels, Dowson, Paxman, Pierson, Tangye, and the Industrial, Loncauchez, Paywell, and Winterthur producers—and then went on to say that the following results had been ascertained: In Dublin, an 18 H.P. electric light engine, with suction-gas plant, working 11 to 12 hours per day, used in this time 84 lbs. of coal. This worked out at 1s. 1d. per 12 hours' run. With town gas at 3s. 8d. per 1000 cubic feet, it cost 6s. 6d. for this run. In Adelaide, on town gas, running 24 hours per day, the cost was about £25 per month. An engine (a 35 H.P. one) and producer, guaranteed not to exceed £25 per month, cost but £9 per month—only a seventh the cost of town gas. He was, however, inclined to doubt this figure—probably it was only the cost of fuel. Taking it at £18, town gas still cost 3½ times more than suction gas. In Huddersfield, an engine ran for nine months on town gas at 2s. 7½d. per 1000 cubic feet; and on producer gas the cost was only one-fourth. The labour per day for starting and stoking occupied only about one hour. In Liverpool, a 40 H.P. engine ran for 34 hours on town gas at a cost of £2 15s.; and on producer gas it went for 74 hours for £1 6s. 4d. This worked out at 1s. 7½d., as against 4½d. per horse power. A firm of brewers in Suffolk had a 10 H.P. engine, running eight hours per day and consuming in this period 56 lbs. of anthracite at 20s. per ton, and it cost 6d. per day. A London firm had an 18 H.P. engine, the cost of which was 6s. per week, compared with 28s. for the same power with town gas. Generally, anthracite coal, costing 20s. per ton, on a 20 H.P. engine, worked out at 2s. 4d. per hour; whereas coal gas, at 2s. per 1000 cubic feet (550 B.Th.U.), using 17 cubic feet per hour, came to 8·16d. per hour. Consequently, they had 6d. per hour saved on a 20 H.P. engine.

[The lecture was illustrated by lantern slides.]

The PRESIDENT said he was sure the members had all listened with the greatest pleasure to the lecture. Suction gas-producers were seriously engaging the attention of gas engineers and managers all over the British Isles; and he thought he was safe in saying that the gas profession were, generally speaking, finding in suction gas a more formidable rival than electricity. They were convinced that the price of gas would have to be very much lowered if they were to retain manufacturers as customers for power. It was evident, however, that suction gas could not, as yet, touch the small consumers—consumers who only required to use a gas-engine for an hour or two a day. Moreover, gas undertakings had a large field before them in the supply of gas for cookers and fires. At the same time, the sooner they reduced the price of gas, the better it would be for them. The lecture had been a very instructive one, and had shown them how the different plants worked. He proposed a hearty vote of thanks to Mr. Wight, and also to Mr. Rule for his paper.

Mr. WIGHT and Mr. RULE having tendered their acknowledgments, the proceedings terminated.

ENGLISH GAS COAL IN HOLLAND.

A recent issue of the "Journal für Gasbeleuchtung" contains an article upon the properties of English gas coals and the quantities that are consumed in Holland; the material being compared in both respects with the coals that are imported from Germany. The information given is obtained from particulars that were supplied by Mr. C. T. Salomons, of Rotterdam, a member of the Purchasing Committee of the Association of Dutch Coal Gas Manufacturers.

The total amount of coal imported into Holland during 1905 from Great Britain and Germany was 6,381,000 metric tons; 1,949,000 tons, or 30·5 per cent. coming from this country. The total amount of gas coal imported in the same year was 816,518 metric tons, of which 525,194 tons were Westphalian and 291,324 tons, or 35·7 per cent., was British. The British total was made up of 242,186 metric tons of Durham coal, 44,287 tons of Yorkshire, 3955 tons of Scotch (United Gas Coals), and 896 tons of unknown origin. Durham coal was carbonized in 170 different works; Mickley coal was carbonized to the extent of 75,367 tons in 43 works; Wearmouth coal to the extent of 46,609 tons in 15 works; New Pelton Main to the extent of 28,317 tons in 27 works; and Londonderry coal to the extent of 22,960 tons in 12 works. Nineteen other varieties of Durham coals were also carbonized in amounts of from 100 to 14,500 metric tons. Yorkshire and Derbyshire coals were carbonized in 45 works; the chief variety consumed being Thorncliffe Silkstone nuts, of which 17,741 metric tons were carbonized in 19 works. Thirteen other descriptions were carbonized in amounts up to 5400 tons.

All the large, and most of the small, gas-works in Holland are so situated that coal can be delivered to them either per ship or per rail; but they naturally find it more convenient to receive their coal in small daily trainloads than in occasional heavy shiploads. In the year 1905, the gas-works at Amsterdam, Rotterdam, The Hague, and Utrecht consumed altogether 407,444 metric tons of coal, 77,382 tons of which, or 19 per cent., was English. The proportion of English coal carbonized at Amsterdam itself is higher than the figure mentioned; for 60,000 metric tons of Londonderry coal were in 1905 consumed there alone. In the smaller gas-works of Holland, roughly equal quantities of English and Westphalian coals are employed.

The article from which we are abstracting goes on to state that English gas coals are cleaner than Westphalian coal, containing less dross. Most Durham coals measure between 42·3 and 43·4 cubic feet per long ton; but Mickley coal measures 44·9 cubic feet. Yorkshire gas coals run lighter—*e.g.*, Thorncliffe Silkstone nuts measure 44·9 to 46·1 cubic feet. As a rule, English gas coals require a longer carbonization at a lower temperature than Westphalian coal. Charges of Westphalian coal are usually worked off in 4 or 5 hours; but similar charges of English coal require 5 or 6 hours for carbonization. The higher temperature at which the English coals are carbonized tends to produce stoppages in the ascension pipes, to thicken the tar, and to encourage the formation of naphthalene; but Mickley, Silkstone, and Wigan coals are free from these defects. The coke of English gas coal is usually harder to break, denser, and larger in size than Westphalian coke; but Mickley coke and that of Yorkshire coal runs smaller and softer. Durham coke, especially that from the New Pelton Main and the Axwell Garesfield coals, has a high calorific value. English coke yields less clinker than Westphalian coke; but it is more trouble to remove from the bars of a furnace. The volume of gas made per ton of English coal is practically identical with that made from Westphalian coal; 10,050 cubic feet and upwards being easily and regularly obtained per long ton. The illuminating power of the gas is also practically the same—*i.e.*, 15-candle power; but the gas from English coal contains more sulphur.

The manufacture of water gas is growing rapidly in Holland, and in many places English coke is preferred to German for its preparation, in spite of the greater difficulty in clinkering the producers. Carburetted water gas is made in 14 Dutch works: Amsterdam (east factory), Rotterdam, The Hague, Utrecht, Leiden, Leeuwarden, Zwolle, Deventer, Tilburg, Maastricht, Alkmaar, Haarlem, Enschede, and Bergen op Zoom. Plant for the preparation of blue water gas is to be erected in five places: Amsterdam (west works), Venlo, Zevenbergen, Arnheim, and Zutphen.

A favourite and typical Durham gas coal used in Holland is Axwell Garesfield. It measures about 42·7 cubic feet per long ton; and on the large scale gives from 10,660 to 10,950 cubic feet of gas per ton, having an illuminating power of 12·3 candles, a specific gravity of 0·367, and a calorific value of 472 B.Th.U. per cubic foot. After purification, the gas contains 18·25 grains of sulphur per 100 cubic feet. The coke measures 80 cubic feet per ton, has a high calorific power, and contains but little clinker. A typical Yorkshire gas coal imported into Holland is Pope's Diamond coal. It measures about 44·5 cubic feet per long ton; and gives on carbonization 10,600 cubic feet of gas, having an illuminating power of 14·6 candles, a specific gravity of 0·394, and a calorific value of 600 B.Th.U. per cubic foot. The purified gas contains 18·15 grains of sulphur per 100 cubic feet. The coke is small and readily combustible; but it is not so well suited as are other varieties to the manufacture of water gas. The clinker in it is small in amount and brittle.

It is said in Holland that Yorkshire coal tends to vary in quality, even when coming from the same pit; but this accusation cannot be brought against Thorncliffe Silkstone nuts. At present Yorkshire provides 15 per cent. of the English coal imported; but the proportion is rising, owing to the lower price. Lancashire coal is also being studied; but it is handicapped by the more expensive voyage from the west coast of England.

The price of first-quality Durham coal has risen steadily since the beginning of 1905 from 8·46 marks to 10·84 marks per metric ton f.o.b. Tyne; and that of the second quality from 8·17 marks to 9·78 marks. To these prices must be added the late 1s. tax, the freight of 3s. 10½d. to Amsterdam or Rotterdam, and the cost of transference into barges—viz., 2d. Hence the prices of Durham coal in Amsterdam last September were 15·95 marks and 14·90 marks per metric ton. The price at the pits of best screened Yorkshire gas coal remained steady during 1906 at 8·40 marks, and that of unscreened gas coal at 6·90 marks; both figures being about 0·50 mark higher than in the previous year. The cost of conveying Yorkshire coal from the pit's mouth to a barge at Amsterdam or Rotterdam is 7·65 marks per ton; hence best screened Yorkshire gas coals were quoted last autumn in those cities at 16·05 marks, and unscreened Yorkshire gas coals at 14·55 marks per metric ton. Large quantities of Yorkshire gas coal have been exported lately to France.

POSITION OF GAS MANUFACTURE IN RELATION TO COKE-OVENS.

A recent issue of the "Journal für Gasbeleuchtung" contains an article by Herr F. Schreiber, of Waldenburg, Silesia, in which the author compares the phenomena of coal carbonization that occur in the gas-retort and the coke-oven respectively, and finally devotes some attention to the question of carbonizing limed coal briquettes.

Vertical Retorts and Coke-Ovens.

Herr Schreiber begins his article by remarking that the relative merits of horizontal and vertical retorts have already been frequently discussed, but that there are three points in favour of the vertical retort—viz., the higher yields of tar and ammonia and the production of a larger and more coherent coke—to which further attention may be advantageously devoted. As Hilgenstock and others have already stated, the higher yields of tar and ammonia in the vertical retort are due to the more favourable conditions in which the gas passes away from the mass of fuel, without coming so much into contact with the heated walls of the distilling vessel. With its rectangular cross-section, the vertical gas-retort much resembles a small vertical coke-oven, with the exception that the latter is built of separate pieces of fire-brick, whereas the retort is composed of one continuous piece.

The gases and tar vapours evolved from coal exhibit a greater tendency to decompose as their temperature rises, as they are brought into more immediate contact with the heated walls of the carbonizing vessel, and as they remain a longer period within it. Hence there is a better yield of tar and of ammonia in Bueb's vertical retort than in a horizontal coke-oven. In a horizontal coke-oven, conditions can be improved by providing facilities for the rapid escape of the gases; and therefore it is better to fit such an oven with two ascension pipes arranged centrally about the two halves of the chamber and communicating (as may be preferred) with either one or two hydraulic mains. The author has found on a large scale, by fitting a coke-oven with a second ascension pipe which formerly had one only, that the yield of ammonia from the same variety of coal, calculated as sulphate, was increased by 0·15 per cent.—a gain that quickly neutralized the extra expense involved in constructing the apparatus.

In the conditions of modern coke-oven practice, it is scarcely conceivable that coke-ovens can be built vertically. Per unit of coal capacity the cost of erecting a vertical oven is much greater than that of building a horizontal one, because a vertical oven can only be heated economically when of comparatively small size; while, moreover, when any repairs are requisite, the whole battery of twelve vertical ovens must be thrown out of action. The heating of the horizontal flues round a vertical oven is also less efficient than the heating of the vertical flues round a horizontal oven. In the latter case the natural ascensional force of the gas renders it easy to keep the interior of the horizontal oven at approximately atmospheric pressure; but in the case of horizontal flues, a partial vacuum must always prevail within the vertical oven, which may cause loss of volatile products through leakage. Vertical ovens have the advantage of giving a denser coke; but much greater density still can easily be obtained by the use of compressed coal. The objections that have been urged against the vertical coke oven apply with still greater force to the vertical retort.

The amount of coal that can be carbonized per unit of heated surface of retort is the same as per unit of heated surface of coke-oven—being, in fact, 1·54 lbs. per square foot per hour. But the amount of coal that can be carbonized per unit capacity is twice as great—(*e.g.*, 37·4 lbs. per cubic foot per hour)—in a retort as in a coke-oven. Since per unit capacity there is a greater available heating surface in a retort than in an oven, the carbonization is more thorough and more rapid. This causes the yields of gas and of volatile products to be greater; but, on the other hand, it reduces the yield of coke and impairs its good qualities. Inasmuch as gas is the most important product of a gas-works, what has been already said shows that the retort is the proper apparatus to employ there. From the aspect of obtaining economical and uniform heating of the coke, a retort built in the form of a horizontal coke-oven with vertical flues appears to be the ideal form of carbonizing vessel; but mechanical difficulties prevent a retort being constructed in this manner, and therefore a vertical gas-retort having a cross-sectional area like that of a coke-oven is the best form of apparatus.

The coke made from gas coal in a vertical retort occurs in larger pieces, and is harder than gas coke made in the usual manner. But the yield of really hard coke fit for employment in metallurgy must always be much smaller than that of a coke-oven. Inasmuch as gas-makers lay stress on obtaining a high gas yield, they are compelled to employ a caking coal, which inevitably leaves a porous coke of low specific gravity. A good metallurgical coke can be obtained from caking gas coals by compressing them into blocks in the presence of moisture. In this manner the particles of coal are much more firmly agglomerated than by the natural pressure of a loose column of coal 13 feet high, such as exists in a vertical retort. Moreover, in order to obtain a large coherent coke from caking gas coal, the process of carbonization must be carried out more slowly than is customary on a gas-works. Moisture in the coal is advantageous in this respect, because the high latent heat of water vapour causes the damp coal to rise in temperature slowly, and the gas to be driven off less rapidly than would otherwise be the case. In coke-oven practice, a hard coke is best obtained by carbonizing a coal containing at least 12 per cent. of moisture—a method of working wholly unsuitable to the manufacture of gas. A coke-oven is usually erected close to the coal pit, and can therefore use a cheap coal containing dust. A gas-works must be situated close to its consumers, and must therefore purchase a screened coal free from fine particles, lest it lose gas during storage.

Gas can be made in a coke-oven resembling retort gas, though the oven walls are generally more or less leaky. The mean composition of coke-oven gas is somewhat as follows: Air, 6·20 per cent.; nitrogen, 16·10 per cent.; carbon dioxide, 4·20 per cent.; hydrogen, 42·03 per cent.; methane, 21·86 per cent.; heavy hydrocarbons, 3·10 per cent.; carbon monoxide, 6·50 per cent. This gas has a heating value of 411 B.Th.U. per cubic foot. Still, it does not follow that a coke-oven can continuously produce a gas of equal value to that made in a retort. The retort is fired with coke because the gas is more valuable; the coke-oven is fired with gas because coke is its most valuable product. If, however, arrangements are made to collect the gas evolved in an oven in two separate portions, the first (amounting perhaps to as much as 50 per cent. of the total), which is better in quality, can be sold, while the second portion, of poorer gas, will be sufficient to fire the ovens. Schniewind gives the composition of the oven gas evolved during the first carbonization period in the plant of the New England Gas and Coke Company, at Everett, U.S.A., as follows: Oxygen, 0·1 per cent.; nitrogen, 4·1 per cent.; carbon dioxide, 2·9 per cent.; hydrogen, 44·4 per cent.; methane, 37·4 per cent.; heavy hydrocarbons, 5 per cent.; and carbon monoxide, 6·2 per cent.—the calorific value being 606 B.Th.U. per cubic foot.

The coal carbonized in the coke-ovens of Lower Silesia yields in its air-dried state the following products: Coke, 72·72 per cent. (containing 6 per cent. of ash); and volatile matter, 27·28 per cent. The yield of tar is 3·77 per cent.; ammoniacal liquor, 6·75 per cent.; benzene, 0·881 per cent.; sulphuretted hydrogen, 0·285 per cent.; carbon dioxide, 1·425 per cent. The make of gas is equal to 11,100 cubic feet per long ton of dry coal, and, free from ash, contains nitrogen, 3·87 per cent.; carbon dioxide, 3·30 per cent.; hydrogen, 52·15 per cent.; methane, 30·27 per cent.; heavy hydrocarbons, 4·88 per cent.; carbon monoxide, 8·53 per cent.—its calorific value being 550 B.Th.U. per cubic foot. In terms of ammonium sulphate, the yield of volatile ammonia is 0·937 per cent.; and of non-volatile ammonia, 0·054 per cent.

Carbonization of Limed Briquettes.

The idea of compressing small coal into briquettes under a pressure of 200 atmospheres, with the object of obtaining a harder and more coherent coke than is otherwise possible from a gas coal, renders it feasible to resuscitate the old plan of treating the coal with lime in order to retain the sulphur. It will be remembered that the Cooper coal-liming process was unsuccessful owing to the impossibility of mixing the lime uniformly with lump coal, and owing to the harm done by the lime dust to the eyes of the stokers when drawing the retorts. If coal, however, is to be carbonized in a state of powder, it can, of course, without any trouble, be mixed with a suitable proportion of lime—viz., with (according to the sulphur present) from 3·5 to 4 per cent. Experiments have been carried out on a large scale with the carbonization of a particular variety of compressed powdered coal before and after the addition of 3·5 per cent. of lime; the results being shown in the table, p. 224.

The figures prove that the yield of coke is increased, and also the proportion of sulphur in it; but the extra lime in the coke is not harmful in any steam-raising or metallurgical furnace where it is employed. It will also be seen that the amount of sulphur calculated as sulphuretted hydrogen in the crude gas is decreased by 81 per cent., and the proportion of sulphur, as such, in the

	Before Liming.	After Liming.
Ash of coal, per cent.	5·24	8·74
Coke: yield ,,	68·56	69·77
,, ash ,,	7·40	12·60
,, sulphur ,,	1·03	1·36
,, large Calories per kilo.	7,610	7,279
,, B.Th.U. per lb.	13,700	13,100
Gas: yield per long ton (c. ft.)	11,500	12,200
,, B.Th.U. per cub. ft.	545	539
,, illuminating power (argand)	12·5	11·80
,, ,, ,, (flat-flame)	7·9	7·17
Sulphur in crude gas as H_2S (grains per 100 c. ft.)	195·5	37·2
,, purified gas as sulphur ,, ,,	27·2	7·2
Ammonia as sulphate, per cent.	0·839	1·05
Cyanogen as K_4FeCy_6 (grains per 100 c. ft.)	120·4	88·1
Tar, per cent.	6·6	5·8

purified gas by 73·5 per cent. through the use of lime. The make of gas is somewhat increased. Its illuminating power (quoted in the above table in terms of Hefners at the 150 litre rate) is a trifle reduced. The yield of ammonia is increased by about 25 per cent.; while that of the cyanogen in the gas calculated upon the coal is reduced by about 22 per cent.

In conclusion, the author remarks that the introduction of the Bueb vertical retort brings a coal-gas works a step nearer to a coke-oven factory, but that the two can never become identical in their methods of working, as their aims are different. A really hard coke can be obtained from a coal rich in gas if it is first washed, powdered, and made into briquettes; and the incorporation of a suitable proportion of lime with the coal-dust will have the advantage of giving a larger amount of ammonia, and a better quality of gas which requires less expensive purification than is usually necessary.

THE NEW WATER SUPPLY FOR NEW YORK.

Progress of the Cross River Dam.

There is at present under construction in the Croton watershed near Katonah, New York, a large dam designed to impound about 9 billion gallons of water for an additional supply to be delivered to the city through the new Croton aqueduct. The reservoir will be 3 miles long, and will have a maximum depth of over 100 feet. The dam crosses the valley of the Cross River nearly at right angles to it, with a total length and height of about 900 feet and 170 feet respectively. The south end of the masonry dam terminates in an earth dam oblique to its axis, with a masonry core wall; and the north end, at a corresponding concrete overflow. The maximum cross-section is about 115 feet wide at the base, above which both upstream and downstream faces are battered to a height of about 45 feet. Above this point the upstream face is vertical, and the batter of the downstream face changes from 0·75 : 1 to 0·56 : 1, which continues to a point 50 feet below the top, where it is tangent to a curve of 96 feet radius tangent to the vertical under the coping, where the thickness of the dam is 23 feet. Its foundations are carried down to solid rock at a maximum distance of about 40 feet below the original low-water level of the river. The structure is built of cyclopean masonry faced with concrete blocks of large dimensions corresponding to ashlar masonry. The principal quantities involved in its construction include about 117,000 cubic yards of excavation and 155,000 cubic yards of cyclopean and block masonry.

The importance of putting this reservoir in service at the earliest possible date, so as to hasten the availability of additional water supply in case of threatened water famine, was so urgent, that its construction was deemed a work of emergency. The Aqueduct Commission, in awarding the contract, took into consideration not only the experience and ability for successfully conducting work of this character of the seven competing firms, but also the available plant controlled by each ready to be immediately installed. In consideration of the large amount of suitable plant available and the skill and experience on this class of work, the contract was awarded to one of the highest bidders at a price of $1,246,211. Operations were begun in the latter part of June, 1905; but shortly afterwards work was practically stopped by an injunction. This, however, was removed late in November, and the Contractors began at once to reorganize their force which had become dispersed. Work was started with vigour, and has continued since without interruption. An account of the progress made appeared in a recent number of "Engineering Record," from which the following particulars are taken.

The Contractors diverted the water from the site by means of two earth and rock-filled temporary dams across the valley above and below the permanent dam. These were connected by a wooden flume large enough to carry the ordinary floods of the river over the excavation, and were provided with two 5 feet steel pipes, 90 feet long, supported on steel columns across the axis of the dam. A standard gauge railroad track, 1½ miles long, was built to connect the site with the New York and Harlem Railway tracks, and provide for the delivery of plant and materials. The power plant, with about 1000 H.P. boiler capacity and air-compressors rated at 1120 H.P., was established in the valley south of the dam, and on the hill near the south end of the dam there was also installed a machine and repair shop, a concrete mixing tower and plant, and a yard for casting the concrete blocks. One 18-ton and two 15-ton cableways, all of about 1300 feet span, were installed parallel with the axis of the dam, on moveable towers, enabling them to command the entire area of the work. Two additional cableways with fixed towers were temporarily installed at right angles to these, and a number of derricks were erected to serve the concrete plant, the quarry, and the excavation. The large and complicated plant installed has been supplemented by a very complete machine and repair shop, which has afforded immediate relief in cases of accidents.

The excavation for the foundation of the dam was practically completed for a length of 500 feet in June last year. Little difficulty was encountered with water, most of it being due to surface drainage, which was removed by two steam-pumps with 6-inch suction-pipes and three smaller ones. They were operated only half the time, and had an average lift of about 20 feet. When springs were encountered, masonry walls were built round them, and two temporary 1½-inch wrought-iron vent pipes were connected to them to afford some means of controlling them. The work of laying cyclopean masonry is done by gangs of nine men for each derrick; two being masons, six labourers, and one foreman. The masonry materials are handled by three cableways and twelve stiff-leg derricks in zig-zag rows on the opposite side of the dam. Four of them have 60-feet and eight 54-feet booms—all being operated by engines worked with compressed air. The arrangement of the derricks on both sides of the dam leaves the entire surface of the masonry unobstructed, and provides for maximum rapidity of construction. Two of the cableways are normally used to furnish concrete to the derrick gangs on the upstream and downstream faces of the work. They deliver it in regular rotation from one end of the dam to the other, then return to the beginning, and so on. The third cableway usually delivers stone to the crusher. The best record for a day's work is 245 two-yard buckets of concrete, 12 buckets of mortar, and some stone, handled by two cableways in ten hours.

After the masonry was commenced, it was found that the maximum requirements of power for the derricks, in addition to all the other plant in simultaneous operation, though not beyond its capacity, was too great for the economical working of the central power plant; and three independent 100 H.P. horizontal boilers were installed to furnish steam for the 250 H.P. engine which runs the mixing plant and rock crusher. About 86,500 cubic yards, or a little more than one-half of the total amount, of masonry has been laid since June 1, 1906; care being taken to keep the upper surface within 2 or 3 feet of a horizontal plane which is now more than 50 feet above the bed of the river. The concrete face-blocks are built up one course in advance of the cyclopean masonry, and are laid in 1 : 1 portland cement mortar mixed by hand in steel skips located wherever required on the dam. The blocks are cast at least three months before they are used, and are being manufactured at the rate of about 350 to 500 cubic yards per week; while some 300 to 400 cubic yards per week are built into the dam. Backing stone is quarried at the rate of about 17,500 cubic yards per month, and about the same quantity was used during the past summer. About 35 per cent. of the cyclopean masonry is backing. During last summer, the maximum amount of masonry laid per month was 18,600 cubic yards, which, considering the dimensions of the dam and the number of derricks employed, is believed to be a high record. Under present conditions, it is thought that the dam may be completed by August next. The original schedule contemplated a maximum progress of 20,000 to 25,000 cubic yards of masonry per month during the second season.

Besides the work on the main dam, a large amount of the other work required by the contract was executed during the summer. Trees were cleared from about 350 acres of the reservoir site, and two saw-mills were operated, turning out 1,500,000 feet of timber, nearly all of which has been used at the dam. The principal items of work done during the past year include 110,000 cubic yards of earth and 71,000 cubic yards of rock excavated, including quarries, 12,500 cubic yards of concrete blocks built, 6500 cubic yards of concrete blocks set in the dam, 77,000 lineal feet of boundary walls built, and 87,500 cubic yards of masonry finished in the dam. About 63 per cent. of the basis of the award has been completed. Laying masonry in the dam was commenced on the 27th of May last year.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. Henry Rayner) that the accounts for the past half year show that—subject to audit—the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 8s. per cent. per annum, carrying forward a balance of £229,952 19s. 11d. to the next account. This compares with a dividend at the same rate for the latter half of 1905, and a balance of £181,298 to the good.

The New Electric Light.—It appears that the claims made for the new electric light referred to in the "JOURNAL" last week (p. 141) are being accepted in New York on the strength of Professor Parker's reputation. It seems that he and Mr. Walter Clark, an electrical engineer, have been working together at the University for seven years to find an improved means of lighting; and Professor Parker candidly admits that, more by accident than anything else, he made the discovery which resulted in the production of his lamp.

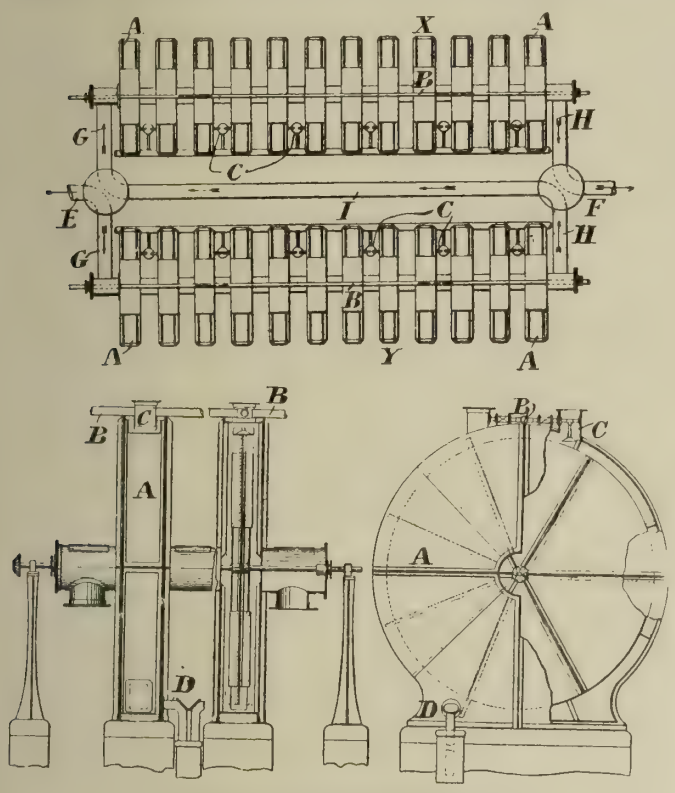
REGISTER OF PATENTS.

Condensing and Purifying Gas.

CLARK, F., of Southend.

No. 26,998 ; Dec. 27, 1905.

This apparatus, for use in the purification of gas, embodies a plurality of chambers fitted with revolving discs with means for supplying liquid, and through which chambers the gas is successively passed. Means are provided for controlling the liquid supply so that it can be cut off for a period from a number of chambers which may afterwards be supplied with liquid, while others are not then so supplied.



Clark's Rotary Condenser and Purifier.

Each chamber is in the form of a drum A ; the several drums (connected together by pipes) being constructed of sheet metal with angle iron framings. A shaft extends concentrically through each set of chambers (supported in suitable bearings) and is provided externally with bevel wheel driving gear. Within each chamber is mounted on the shaft a disc (of somewhat less diameter than the chamber) provided with radial blades connected by arms to bosses surrounding the shaft. Usually these blades are at the peripheral portions of the discs only, and are attached thereto indirectly—as by riveting to lengths of angle iron secured to the discs. Other radial blades, secured to the end walls of the chamber, are constituted by lengths of angle iron. An external water or liquor supply pipe B is connected with the interior of each chamber, and provided with a spraying device. These spreading devices are usually arranged in the upper parts of the chambers, as in the casings C. The lower part of each chamber is provided with an outlet D, for carrying away tarry and other matters—the delivery being here shown as taking place into a seal-pot.

The two sections or sets of chambers X and Y are so connected by pipes and provided with controlling means that gas flows in either direction through both, so that while passing through one set (say X) the treatment will be dry, whereas on reaching, and while passing through, the second set (say Y), the treatment will be wet. Afterwards gas can be caused to flow in the contrary direction and undergo dry treatment in the set Y in which wet treatment previously took place, and wet treatment in the section or set X in which dry treatment previously took place.

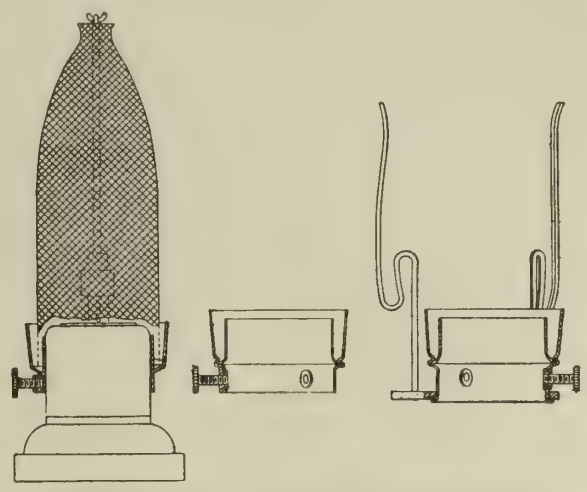
E is the inlet pipe and F the outlet pipe. G and H are pipes connecting the adjacent ends of the two sections with the gas inlet and outlet pipes respectively ; communication being controlled by two four-way valves, which also control communication between a pipe I and the ends of the two sections. With this arrangement the gas may be caused to flow through the apparatus in the direction of the arrows, first through Y and then through X, or in the reverse direction. The revolving discs, with their paddle blades, throw the gas towards the air-cooled sides of the chambers A, and it is well rubbed against the blades as they revolve—thus causing the tarry particles to be freed from the gas and thrown down to the bottom of the chambers ready for escape into the tar main or well. The " formation of naphthalene crystals between the stationary blades on the walls of each chamber will be assisted when the degree of temperature is suitable for the formation of such crystals."

Mantle Protector.

MARK DUFFIELD & SONS and J. UPTON.

No. 27,139; Dec. 29, 1905.

This is an adjustable combined protector and support for the base of an incandescent mantle, consisting of a collar having an inner and an outer rim, so as to form an annular groove near the top of the burner when the mantle is new. Within the groove rests the lower edge or base of the mantle in combination. Means are provided for holding the combined protector and support in position on the burner so as to suit the length of the mantle. Thus the combined protector and support is capable of being raised to support and protect the base of the mantle as it becomes frayed or broken. The illustration shows one form of " protector " with mantle attached ; a modification of the arrangement apart from the mantle ; and a view of the protector combined with a chimney or globe support.



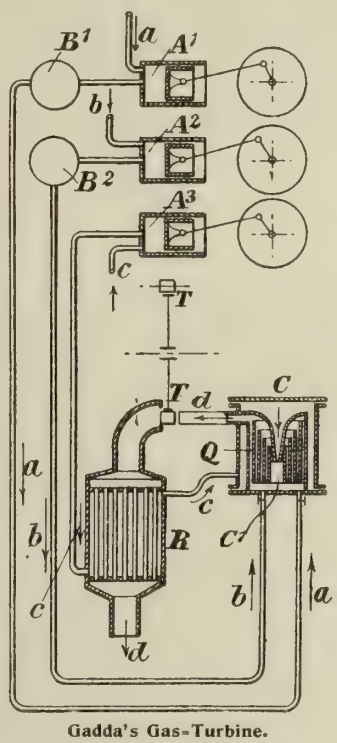
Duffield and Upton's Mantle Protector and Support.

Gas-Turbines.

GADDA, G., of Milan, Italy.

No. 27,272 ; Dec. 30, 1905. Date claimed under International Convention, Jan 2, 1905.

According to this invention, the utilization of a portion of the heat, which in ordinary gas-engines is lost with the exhaust gases and the circulating water, is attained by a gas-turbine arranged according on the following plan : The explosion is caused to take place in a chamber into which air and a fluid are separately introduced ; and the explosion products are allowed to expand through the turbine, in communication with the explosion chamber, in which no pieces of mechanism are kept in motion, so as to admit of a higher average wall temperature than that of usual piston engine cylinders. In the explosion chamber a substance is contained, which is capable of absorbing an amount of heat, not exceeding that carried away in the usual engines by the jacket water, and of giving up the heat in a successive phase to another fluid, utilizing it " with a satisfactory efficiency." The exhaust gases escape through a heater, so that they are utilized to heat the substance which performs the supplementary cycle, as will be described.



Gadda's Gas-Turbine.

There are three pumps A_1 A_2 A_3. In the first, a fluid (either a liquor or a gas) is compressed, which is capable of burning or exploding when mixed with a quantity of air. The compressed fluid is stored in a tank B_1 acting as a receiver, with the view of rendering the supply of the turbine independent of the alternate lifting of the pump valves, and having a fluid under pressure at disposal for starting the motor. In pump A_2, the air intended for mixing with the fluid supplied by pump A_1 is drawn in, compressed, and then likewise stored in a tank B_2. The pump A_3 is intended for compressing the fluid which is to perform

the supplementary cycle. Should air be the fluid chosen for this purpose, the two pumps A_1 A_2 would, of course, be sufficient.

A chamber C contains the explosion chamber proper C^1, wherein the air and the fluid, supplied by the pump A_1, are separately introduced. Explosion or combustion under constant volume is caused to take place, whereupon the explosion products are allowed to expand through the turbine T, the first guiding apparatus of which communicates with the explosion chamber. Within the explosion or combustion chamber, a substance Q is contained, which has no effect upon the fluids surrounding it, for which the product of the specific heat by the coefficient of transmission of heat is a maximum, and which gets heated at the expense of a portion of the heat developed by the explosion or combustion products up to the maximum temperature consistent with the nature of the materials of which the chamber C is made, as well as with the nature of the substance in question itself.

There is a turbine T (of any known type); also a heater R, through which the gases, which have expanded within the turbine, are allowed to escape with the aim of heating (by means of their residual heat), at a constant volume, the fluid that has been compressed by the pump A_3 and is intended to perform the supplementary cycle.

In the drawing, the arrows A refer to the motion of the fluid which is performing the primary cycle; the arrows B refer to air; the arrows C to the fluid for the supplementary cycle; and the arrows D to the explosion or combustion products.

The two cycles succeed each other within the turbine. As soon as the explosion or combustion has taken place in the chamber C, and the pressure has become as low as that of the fluid which is to perform the supplementary cycle, the fluid (which has been heated both at a constant volume within the heater R and by its having been caused to circulate around the chamber C, thereby absorbing the heat which otherwise would have been wasted) enters the explosion chamber, where it gets heated again at the expense of the heat stored within the substance Q, which is always contained in the chamber C, and is thereafter allowed to expand within the turbine. As soon as the pressure within the explosion or combustion chamber, which also works as a regenerating chamber, has sunk so as to equal the pressure of the air and fluid respectively supplied by the tanks B_1 and B_2, they enter the chamber, mix, and are ignited in due course. The turbine is therefore alternately driven by the explosion or combustion products and by the fluid heated at the expense of the heat drawn from the combustion or explosion products. This fluid may also be utilized with the view of cooling the parts of the movable wheels of the turbine which are most subjected to heating.

Distilling Coals and Other Hydrocarbonaceous Substances.

THOMPSON, W. P.; a communication from H. WURTS, of Newark, N.J., U.S.A.

No. 753; Jan. 11, 1906.

This invention relates to the distillation of coals—particularly cannel, bituminous, and other coals having a high percentage of volatile matter—shales, lignites, and other hydrocarbonaceous substances which yield, when subjected to heat at certain temperatures, vapours of heavy oils, waxes, naphthas, phenols, and other products.

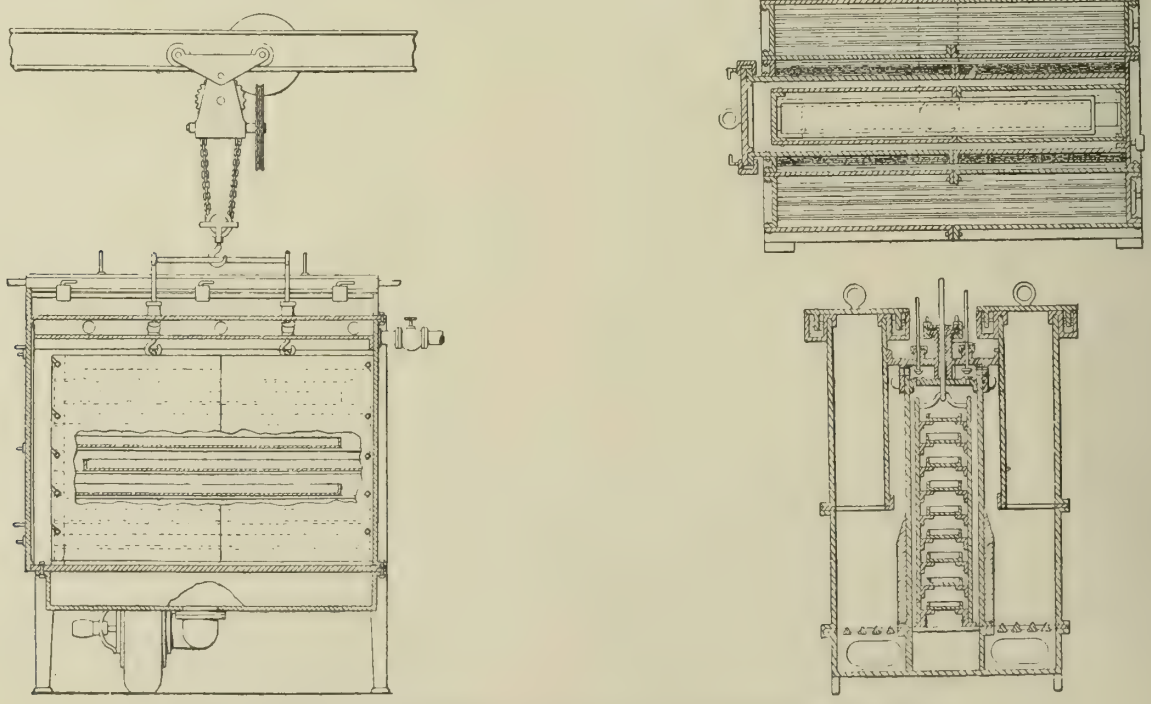
The object of the invention is: First, to obtain by the distillation of the substances the maximum amount of the products which are thrown off at the lower temperatures without dissociating the initial products or producing any, or but a minimum quantity of, gaseous products. Second, to prevent the destruction, by combustion, of the residual coke produced by the distillation of cannel and other coals. Third, to promote the rapid, continuous, uniform, and practically simultaneous distillation of the entire charge of these substances in the distilling apparatus. Fourth, to extract the volatile products of coals, shales, lignites, and other hydrocarbonaceous substances by direct contact therewith of free moving currents of the hot products of combustion or hot neutral gases, and thus effect a thorough extraction of these products from the substances and greatly reduce the time required for distilling a charge. Fifth, to ensure an uninterrupted movement of the heat currents into, through, and out of, the distilling chamber, and their intimate contact with the coal or other substances therein, so that the melting down or coking of a part of the charge will not interfere with the movements of the heat currents. Sixth, to prevent interruption of the movements of the heat currents by the clogging of the interstices between the coals, or lumps, or pieces of lignite, shale, or other similar substances, by the condensation of the heavy vapours distilled from them. Seventh, to promote the rapid efflux of the vapours from the distilling chamber and, by carrying them away from the inflowing heat as rapidly as they are thrown off, prevent their dissociation and the formation of gaseous products.

In previously suggested processes for the distillation and carbonization of materials of the kind indicated, the patentee says it has been recognized that it is advantageous to treat the materials, in small quantities, separate from each other and submitted at relatively low temperatures to the action of currents of neutral gases, which do not contain free oxygen. In these earlier processes, the chambers containing the materials have been in some cases externally heated; but in all cases the hot gas has been generated in non-contiguous apparatus. By the present process, the distilling chamber is heated from the outside by means of a contiguous furnace, and this furnace also acts as the generator for the heated gas supplied in a continuous current to the chamber.

In carrying out the process, the cannel (for example) is placed in a casing open at the top and bottom, and enclosed in an air-tight chamber. A heat producing apparatus is employed; and the products of combustion are carried into the casing and caused to impinge upon the coal in the casing, by passing over and laterally through it. The casing connects with an exhaust pipe that leads to an exhaust-blower, which draws the vapours out of the casing as fast as they develop, and drives them through a suitable connecting pipe into a condenser. The charge is placed in the casing and divided into relatively small bodies, which are isolated from each other, so that a passage is formed between the separate bodies for the heat-currents. The temperature is kept below the point of incandescence or red heat—it should range from about 650° to about 800° Fahr. When the temperature is within these limits, the exhaust-blower is started and driven at a high speed, thereby reducing the pressure in the distilling chamber and causing the heated products of combustion to enter the casing, flow through it over and under the bodies of coal, and impinge upon the coal, and thus distill therefrom the vapours which, as they develop, mingle with the heat-currents, and are caused to flow with them out of the distilling chamber and are driven by the exhaust-blower to a condenser, or to two or more condensers, where the vapours are condensed. The temperature being from 250° to 350° Fahr. below red heat, "neither tar nor naphthalene, benzol, sulphur, or other gaseous product is produced." The effect of these relatively low temperatures is to cause vapours and sprays of the heavy oils to be drawn out of the coal; and these are swept rapidly away from the points where they develop, and are carried out of the distilling chamber before dissociation can take place.

The apparatus (as shown) comprises an exterior structure in which are fire-chambers, heat-flues, fuel magazines, a compartment between the fire-chambers and the heat-flues, and a trough below the compartment, into which the vapours descend on their way to a pipe leading to an exhauster, which forces the fires and the heated products of combustion into and through the casing, and in contact with the coal therein, and also draws the vapours out and drives them to the condenser. The apparatus also comprises a casing that fits into the compartment; and the material to be distilled is placed therein. The casing is adapted to be readily and quickly moved into, or withdrawn from, the compartment.

The operation of the apparatus is as follows: The casing rests, when in the compartment, on a base-frame as shown. To move it out



Wurts's Plant for the Distillation of Coal and Other Hydrocarbonaceous Substances.

of the compartment for the purpose of putting the material on the trays, it is lifted by means of the pulley until it is suspended just above the base-frame, and (the door of the compartment having been previously removed) the casing is run out of the compartment by means of the trolley. The trays are then filled with cannel, heaped up more or less. The trays are then carefully adjusted so that a zig-zag passage is formed through the casing. The door is then put in place, and the casing run back into the compartment and lowered until it rests on the base-frame. The fires are then started up, and the dampers in the pipes (only one of these pipes and dampers being shown) leading from the draught openings to the stack (not shown) are opened for a short time to quicken the fire. When the temperature in the apparatus reaches (say) 650° Fahr., or below red heat, the dampers are closed, and the exhaust-blower started and driven at a high speed. The effect of this is to draw the air through the fires and the hot deoxidized products of combustion up through the heat flues, then through perforations into the valve chambers, then downward into the casing past the valves, through the zig-zag passage, and through the main casing. In passing downward, the products of combustion necessarily pass over and in contact with the coal on the trays to the spaces between the trays and the end walls of the casing, and descending through these spaces pass in the opposite direction under the bottoms of the trays. Thus the coal in each tray is exposed to the rapidly moving currents of the hot products of combustion; and the action of the heat in drawing out the oils is continuous and rapid. The temperature not being sufficiently high to produce tar or dissociate the initial products, no naphthalene, benzol, or other gaseous product is formed; but large quantities of vapours of oils and waxes and phenols are produced.

The operation is said to be of very short duration compared to that of a white-hot gas-retort, "in which the heat is largely expended in the work of dissociation of the first products."

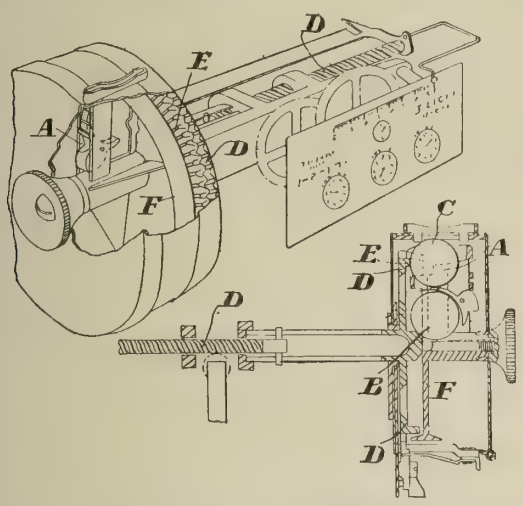
When the coals are distilled, "large amounts of a very valuable coke are produced, which (being the residuum of the distillation of the coal at a comparatively low temperature) is hard, porous, free-burning, and practically devoid of volatile matter, and differs in many essential respects from the coke produced in coke-ovens and gas-retorts.

Coin-Freed Gas-Meters.

DUNCAN, R., of Acock's Green, Birmingham.

No. 8197; April 5, 1906.

This invention has reference to coin-freed gas-meters, in which the gas is liberated by means of pennies or halfpennies—the latter, when in use, standing one upon the other. The present improvement has for its object to arrange for the introduction of thin or worn halfpennies, which have hitherto been liable to wedge together—the principle being the same as that involved in the inventor's prior patent (No. 9373 of 1905), in which an indicator lock is adapted to be operated by halfpennies as well as pennies.



Duncan's Coin-Freed Gas-Meter.

A perspective view of the mechanism of the meter, and a sectional back elevation showing the positions of two halfpennies when in the meter, are given.

The operation by a penny is similar to that now in general use; but for two halfpennies the casing or slot A upon the wheel part E, which the coin enters, is provided with a crescent-shaped pivoted lever, so weighted or arranged that the lower part is engaged by the first halfpenny B, and held in such a position that the upper part forms a support for the second halfpenny C. When in this position, the latter operates the mechanism D for adjusting the supply of gas in the same manner as in the case of the penny—*i.e.*, by engagement with the serrated surface E; while in the case of the release of the two halfpennies, the weighted lever is so arranged that, upon the further rotation of the wheel part F, both coins are free to fall out of the slot or casing in the ordinary manner.

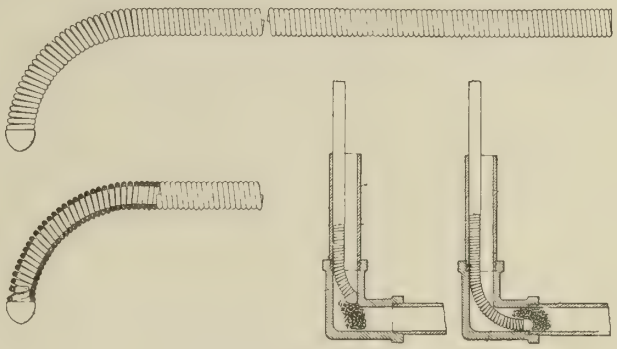
Removing Obstructions in Gas Piping, Tubes, and the Like.

WARD, E. A., of Handsworth.

No. 5116; March 2, 1906.

This invention relates to instruments for removing stoppages in gas, water, and other pipes, tubes, &c., particularly such as have bends, elbows, angles, or other curved parts.

As shown, the tool or implement is formed from coiled spring wire; the body part which is normally straight has such a degree of inherent elasticity that it will bend freely in any direction, but always recover its normal straightness on the bending stress being relieved. The pilot or leading end is made from the same length of metal as the body of the instrument, but is, in process of manufacture, bent to a curvature suitable for giving a lead to the body of the appliance in passing through pipe bends or angles, and is made to take a permanent or definite set in such curved form prior to the spring metal being hardened and tempered. The result is that, when the curved spring pilot end is forced to assume a position more or less in line with the body of the appliance, it becomes tensioned (more or less, in proportion to the extent to which it is straightened), and remains in this condition so long as it is under restraint; but on the straightening force being relieved, then the reaction of the spring metal restores the piloting end to its normal curvature. This is for facilitating the passage of the tool through bends, curves, or elbows, by introducing the end into a straight part of a pipe in a more or less straightened, and therefore tensioned and active, condition, so that when, on being forced through the pipe, it meets with a bend or angle, the restraining influence of the straight portion is relieved, and the pilot end immediately assumes its curved form, which "enables the implement to easily negotiate the passage through the bend or angle."



Ward's Pipe Obstruction Clearer.

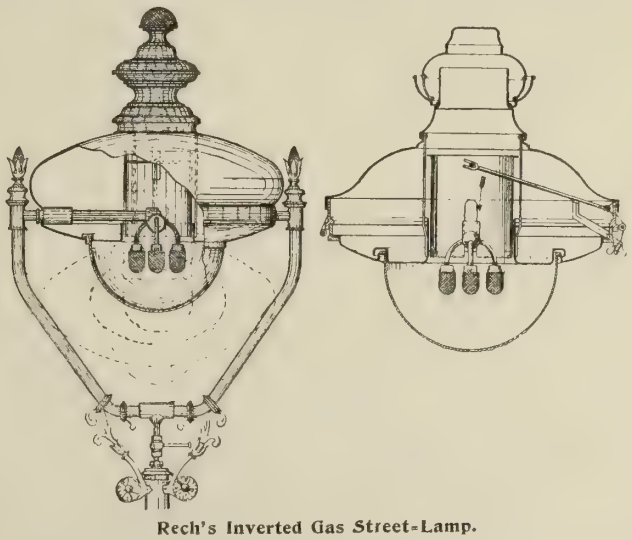
The illustration shows: (1) the specially formed pilot or leading end of the same upon clearer; (2) a part section of the pilot end; (3) the position which the normally curved pilot end of the appliance assumes with respect to the body part when being passed through a straight length of piping, or before reaching an angle or bend; and (4) how the pilot end gives lead to, and facilitates the passage of, the implement round an elbow or right-angle junction piece on being relieved from the restraining influence of the straight part of the pipe into which it was introduced in a partially straightened, and therefore tensioned, condition.

Inverted Incandescent Gas Street-Lamps.

RECH, F., of Brühl, near Cologne.

No. 14,877; June 30, 1906.

In the street-lamp illustrated, the two arms of the lamp-post, made from gas-tubes and conveniently bent, are connected with the gas-supply tube within the lamp-post. The upper ends of the two arms are connected with a horizontal gas-tube on the left side and with a short piece of gas-tube on the right-hand side; and the roof of the lamp may be fastened on to these tubes. To a tubular connection in the middle of the lamp is attached several inverted burners and incandescent mantles by means of bent tubes. A mixing-chamber of any known construction is disposed on some convenient point of the gas-tube, and is thus placed outside the path of the waste gases, which escape upwards from the mantles within the globe, so that they do not prevent



Rech's Inverted Gas Street-Lamp.

the fresh air from entering the mixing-chamber. A movable chimney is vertically guided in the central border of a plate suspended from the roof by rods, and this may cover the globe. The chimney is provided with a slot in which a horizontal gas-tube engages and whereby it is guided. A horizontal bar passes through the chimney, and is secured therein in any known manner. This bar engages in a slot at the free end of a lever mounted on the inside of the roof so as to rock. It passes through a slot in the chimney as shown. The ring carries an arm adapted to act upon the lever.

In the normal position (shown) of the reflector, the arm will hold

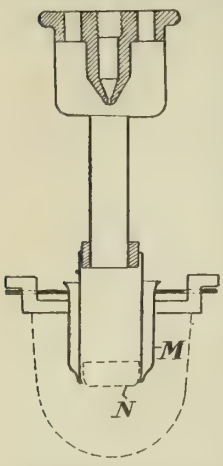
the lever, and thereby the chimney, in the uppermost position. When, for inspecting or cleaning the interior of the lamp, the nut is unscrewed and a bolt is turned out of its slot, and the reflector, with the globe, and the arm is turned downwards, the arm permits the lever with the chimney to lower, until the latter rests on the border of the plate, in which lowermost position it will surround the mantles and protect them from external influences. On turning upwards the reflector, with the globe, of course, the lever with the chimney will be returned to the initial position by the arm.

Inverted Incandescent Gas-Burners.

HADDAN, H. J.; a communication from the Aktien-Gesellschaft, vorm C. H. Stobwasser and Company, of Berlin.

No. 19,406; Aug. 30, 1906.

This invention consists in the insertion of a piece of gauze in the burner, to prevent back-firing. But the gauze (instead of being placed inside the burner as hitherto) is situated at the mouth, which "not only prevents back-firing, but, by its position, causes the flame to assume a spherical shape, so that pressure is uniformly distributed over the inner surface of the mantle." Novel means are also claimed for preventing overheating of the burner-tube, by means of a jacket separated from the tube so as to form a heat-insulating space.



Stobwasser's Inverted Burner.

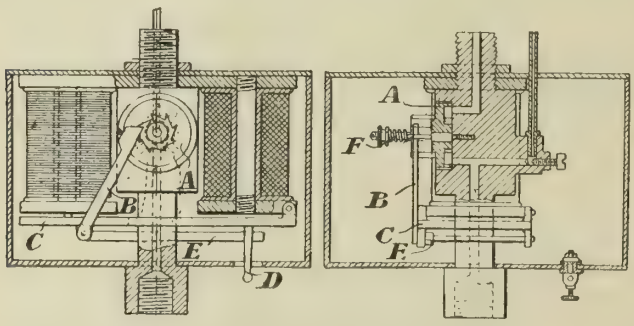
At the orifice of the burner shown is arranged a piece of gauze N, and the tip is surrounded by a jacket M. To the latter is connected a vertically adjustable support for the incandescent body. The adjustability of the support allows of regulating the extent to which the burner projects into the mantle. The gauze prevents back-firing at the time of ignition, and also allows of using a highly efficient mixture of gas and air without danger of back-firing during the use of the burner. The mantle is preferably so adjusted that the burner-orifice is approximately at the centre. An intense and uniform lighting effect is thus obtained—the spherical flame produced surrounding the lower part of the burner-tip and heating it to a high temperature. Back-firing or inversion of the flame is prevented by the heat-insulating space between the burner-tip and the jacket. Without the insulating space it would, the patentees remark, be impracticable to use the gauze with advantage.

Lighting and Extinguishing Gas-Burners.

ABEL, K., of Vienna.

No. 16,760; July 25, 1906.

The lighting and extinguishing of gas, according to this invention, is effected by a switch wheel actuated by electro-magnets—the wheel forming a rotary valve, the working surface of which is formed with a circular channel having radial grooves diverging from it, which at each motion of the switch alternately connect or disconnect two apertures in the gas-pipe, which ordinarily are not in communication with each other.



Abel's Gas-Burner Lighter and Extinguisher.

The body of the burner is formed with two passages, through which the gas comes to the burner and passes to the flame, and the adjacent ends of which open outwards into a recess in the side of the burner, by cross passages. In the recess a rotary valve A is mounted. The outer side of the valve is formed with ratchet-teeth, with which a pawl B, connected by a pivot to the armature C, can engage. The valve on its working face is formed with a circular groove having four radial grooves radiating from it and arranged at an angle of 90° to each other. The armature is connected at one end by a pivot direct to the pole of a magnet, and is provided with a stop D for the limitation of its movement. On the pivot of the pawl B is mounted a bar or rod E, through the weight of which the catch is caused to engage with the ratchet-wheel. The end of the pawl is formed with two parallel faces —the lower face corresponding to the obliquity of the ratchet-teeth, and the upper face, when the catch is in its highest position, being pushed against a stationary stop pin. In this way it arrests the lift of the pawl, and ensures "an accurate and regular movement of the ratchet-wheel," and prevents further displacement of the valve through any upward movement of the pawl. If the opposite grooves coincide with the cross passages, connection between the axial passages is made; but when the valve A is turned another 45° (due to the ratchet being moved forward a tooth), this communication is interrupted. The alternate connection and disconnection are repeated every time the valve is moved forward. Owing to the connection of the armature to one of the magnetic poles, the same polarity is imparted to it; and so the power of attraction of the other pole is increased. A spring F presses the valve A against its seat, and in this way acts as a packing.

The head inserted in the burner (which is formed in the ordinary way) is provided with a hollow cylindrical wire screen, through the bottom of which passes a lighting tube or bye-pass; while the top edge of the burner-head projects above the end of the lighting tube or bye-pass and so protects the flame.

APPLICATIONS FOR LETTERS PATENT.

365.—GROCOTT, R. T., "Inverted mantle suspender." Jan. 7.
370.—HELPS, G., "Gas lamps and burners." Jan. 7.
451.—BILLINGTON, W. J., "Inverted burners." Jan 7.
476.—EHMANN, C. P., "Inverted burner nozzles." Jan. 8.
484.—CALLCOTT, C. W., "Combined coal cooking-range and gas warming-stove." Jan. 8.
566.—FARNSWORTH, J., "Carburetted air." Jan. 9.
639.—COWPER-COLES, S. O., "Extraction of sulphur from sulphur compounds." Jan. 10.
646.—BRUCE, A., "Air-gas machines." Jan. 10.
650.—THORP, T., "Rotary meters." Jan. 10.
651.—WOODALL, H. W., and MOON, P. G. G., "Testing mantles." Jan. 10.
666.—KRÖNER, A., "Determining the intensity of gases." Jan. 10.
702.—BERNHARDT, P., "Regulator for gas-nozzles." Jan. 10.
723.—MALDEN, W. J. & A., "Treating tars and pitches." Jan. 10.
800.—COLLINS, H. A. D., "Gas-retorts." Jan. 11.
805.—MIEVILLE, M. F., "Carburetted air." Jan. 11.
826.—COOPER, J., and YOUNG, W., "Incandescent burners." Jan. 12.

Coventry Water Scheme.

The Coventry City Council held a special meeting last Tuesday for the purpose of confirming the resolution passed on Dec. 4 sanctioning the water supply agreement with Birmingham. Alderman Bird, the Chairman of the Water Committee, moved the resolution, which, he said, had been already adopted by 34 votes to 10 at a meeting of the Council, and by 76 votes to 2 at the town's meeting called to take the matter into consideration. Mr. Band wanted to know if it was right for Corporation officials and members of the Water Committee to vote at the town's meeting; and Mr. Grant sought an explanation as to the charge for water in the scheme—suggesting that this showed nearly 100 per cent. increase where rateable value was concerned. Alderman Maycock said that members of the Water Committee, and also officials, had as much right to attend and vote at the meeting as anyone else. The Town Clerk informed Mr. Grant that it did not follow the charges made for water would be up to the maximum amount that could be levied. He could not say whether the maximum scale of charges was less than that made by the Birmingham Corporation. The latter had had no hand whatever in fixing it. The scheme was approved by a large majority.

Terrible Earthquake in Jamaica.

News reached England last Wednesday morning of the occurrence, on the previous Monday afternoon, of an awful earthquake in Jamaica, by which Kingston had been destroyed. Subsequent accounts furnished details of the terrible calamity, which is the second of the kind by which the island has been visited, and the third which has happened in the western hemisphere within twelve months. From these we learn that not only has there been great destruction of property, but unhappily considerable loss of life. Kingston had long been the most important town in the British West Indies. It had a population of nearly 50,000, and covered altogether an area of more than 1000 acres sloping to the sea on the northern side of a landlocked harbour capable of accommodating the largest ships. Built on a bed of gravel and well drained, it had enjoyed an enviable reputation for freedom from malaria and for general healthiness. The streets ran either north and south or east and west at right angles to one another. The principal among them had been reconstructed in recent years and paved with brick, macadam, or asphalte; the water supply was improved and increased; and electric cars traversed the principal thoroughfares. The city in general was lighted with gas; but in many of the more important buildings electric light was in use. The gas-works are owned by the Government, and according to the last statistics to hand, the annual make of gas was about 18 million cubic feet. There were only 250 consumers, out of the population named, and 700 public lamps, of which 100 are fitted with incandescent burners. The telegrams which have been received do not furnish very many particulars as to the extent to which the gas supply has been affected; but one thing is certain—that serious havoc has been played with both the manufacturing and the distributing plant. The water reservoir was wrecked, and the mains were broken in all directions; and consequently fires had to be left to burn themselves out. Relief measures were promptly organized; and, notwithstanding the wreck produced by the calamity with which the island has been visited, one of the latest telegrams from the locality contained the hopeful message that there was no reason why confidence in its growing prosperity should be diminished.

The Want of a Gas Crematorium.—Referring to the remarks on the above subject quoted in the "JOURNAL" last week from the writer of "Notes on Gas Lighting" in the "Ironmonger," Messrs. Wilsons and Mathiesons, Limited, in the course of a letter to that publication, say: "We have suggested a remedy for this apparent defect to a prominent member of the Smoke Abatement Society—namely, that there cannot be a better crematorium for refuse than the present fireplace in the kitchen, and that all that is required is a bunsen burner, arranged with a hook to suspend on the front bars, so that the flame will play between the grate-bars. The burner could be attached with a piece of india-rubber tube to a small cock inserted in the top of the gas-cooker, which is usually fixed near the fireplace. The gas could then be lighted, and the whole of the refuse burnt in the fireplace as if a fire were lighted—the chimney being quite long enough to take any obnoxious smell above the top of the house."

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

Open Ventilators in Retort-House Roofs.

SIR,—With regard to what is stated on p. 146 of the "JOURNAL," that the original introduction of the above "was no doubt more by accidental circumstances than design," may I point out that the description of the Windsor Street works, which you published in 1886, shows (Plate 6) this feature in the design of the retort-house roofs. This, however, was not original so far as I am concerned; but if I rightly recollect, it was copied from a roof constructed by Mr. Morton at the Nine Elms Gas-Works. At all events, I believe that I had seen it somewhere. But what I have said shows that the above observation is scarcely correct.

CHAS. HUNT.

15, *Victoria Street, S.W., Jan.* 18, 1907.

Institution of Civil Engineers Engineering Conference and the Gas Institution Meeting.

SIR,—The announcement has just been issued that the fourth Engineering Conference of the Institution of Civil Engineers is to take place in London on the 19th, 20th, and 21st of June next.

It is much to be regretted that these dates coincide with those decided upon in October last for the annual meeting of the Institution of Gas Engineers, to open in Dublin on Tuesday, the 18th of June.

WALTER T. DUNN,
Secretary Institution of Gas Engineers.

39, *Victoria Street, S.W., Jan.* 17, 1907.

Gas Testing.

SIR,—In the Acts of Parliament which govern the statutory undertakings of corporations and companies supplying gas, there is a clause inserted prescribing the method of testing; and up to the session of 1906 the clause in the Model Bill issued by the House of Lords was as follows:—

> "The prescribed burner shall be [ ] or such other burner as shall for the time being be approved by the Board of Trade."

The prescribed burner usually adopted was the "London" argand burner No. 1; but in 1905, Mr. Carpenter invented his "Metropolitan" argand burner No. 2; and this burner has been substituted in the Model Bill for the session of 1907, and the clause now reads as follows:—

> 27. (1) The quality of the gas supplied by the company shall, with respect to its illuminating power, be such as to produce, at the testing-place, when burned at the rate of five cubic feet per hour, a light equal in intensity to the light produced by fourteen sperm candles of six to the pound, each consuming 120 grains of sperm per hour, and shall be in all respects in accordance with the provisions of the Gas-Works Clauses Act, 1871.
>
> (2) For testing the illuminating power of the gas, the burner to be used shall be that known as the "Metropolitan" argand No. 2; the photometer shall be the bar photometer (or the table photometer); the standard light shall be that supplied by Harcourt's ten-candle pentane lamp; and in making the test the burner shall be so used as to obtain from the gas, when burned at the rate aforesaid, the greatest amount of light: Provided that the Board of Trade may, on the application of the company or the local authority (the council or any five consumers), approve the use of any other burner, photometer, or standard light, which may appear to the Board to be equally or more suitable for the testing.
>
> (3) The company shall, before supplying, or within three months after beginning to supply, gas under this Act, provide all the apparatus required by this Act for the testing of gas, and shall at all times keep the same in proper order and repair.

I doubt very much whether gas consumers outside London, or the local authorities who represent them, are fully aware of what this change of burner means. The effect is that the "Metropolitan" argand burner shows the gas thereby tested to be from two to three candles higher in illuminating quality than when tested by the "London" argand burner. In other words, the corporation or company who now have to supply a 14-candle gas as tested by the "London" argand burner can, by adopting the new burner, distribute gas of a lower quality by two or three candles, and of an equally lower calorific value, than that which they are now supplying.

The change in the method of testing the gas will enable the gas-supplying corporation or company to obtain a higher yield of gas per ton of coal carbonized with the present coal they use, or they will be able to purchase cheaper coals and obtain the same yield of gas but of a lower quality.

The result of this is a considerable increase in the profits of the corporation or company, while the consumer gets an inferior quality of gas.

It is, of course, said that a lower quality does not matter where incandescent burners are used; but although the number of incandescent burners is steadily increasing, there is still a large number of flat-flame burners in use, and these burners will continue to be used under certain circumstances.

There will, however, be some loss in the illuminating quality of an incandescent burner by adopting the "Metropolitan" argand test-burner; and there will also be a loss in calorific value, which I am informed might in some cases render the gas almost valueless for cooking purposes or for gas-engines.

"What's in a name?" In the present instance, apparently there's a good deal of difference. A gas consumer probably knows as little about the "London" argand burner as he knows about the "Metropolitan" argand burner; and he will not concern himself about either, unless it be clearly pointed out to him what the difference in the burners means.

As I said above, I very much doubt whether he is aware of the difference. Gas companies are only just understanding it; and, under the first Model Bill clause I quoted, they are beginning to apply to the Board of Trade to sanction the alteration of burner. I contend that these applications are being made, not in the interests of the consumer, but solely for the purpose of increasing the profits of the company or corporation supplying the gas.

I recognize that your paper is not the best medium for reaching the gas consumer; but I would suggest to those companies or corporations who propose applying for sanction to adopt the new burner, that they should either increase the illuminating power to 16 candles or reduce the price of gas by the equivalent of the additional profit made.

CHARLES E. BAKER.

54, *Parliament Street, S.W., Jan.* 14, 1907.

[As it is highly desirable, for uniformity of testing, that the Metropolitan No. 2 burner should come into general use as speedily as possible, it cannot be too widely known that the model testing clause adopted by Parliament after full consideration, prescribes the use of this burner. We, therefore, publish the above letter; although the text of the clause has already appeared in the "JOURNAL." From his letter, it might be inferred that Mr. Baker is not aware that the Metropolitan No. 2 burner has been adopted by the Gas Referees for testing the gas of the three London Companies, under the provisions of the London Gas Act, 1905. That which is good for London in this respect should be good also for the Provinces. Whether or not companies or corporations seeking to substitute this test-burner for any other should either increase the nominal illuminating power of their gas or reduce its price, as suggested by Mr. Baker, is a question as to which he is scarcely called upon, even if competent, to form an opinion.—ED. J.G.L.]

The New Gas-Works at Hathersage.—We have received a further letter on this subject from Mr. T. Brown, of Matlock. Referring to the statement in the letter of Messrs. J. Firth Blakeley and Co. which appeared last week, to the effect that the No. 11 gauge sheets inadvertently used in the cupping of the gasholder were "replaced within a week of being found wrong," Mr. Brown says "the whole ring of sheets was condemned on the 31st of October, but the new sheets to replace did not arrive at Hathersage until the 16th of November." This matter has now been sufficiently debated in our columns, and any further questions in dispute between the parties must be settled elsewhere.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Jan. 14.

(*Before Mr. Justice* JELF.)

Chester Water-Works Company v. Guardians of Chester Union.

In the "JOURNAL" for the 1st inst. (p. 42), we reported the arguments and evidence in this case, at the conclusion of which his Lordship reserved judgment, which was delivered to-day in favour of the plaintiffs.

Justice JELF said the action was brought by the Chester Water-Works Company against the Guardians of the Poor of the Chester Union (1) for a declaration that, on the true interpretation of the Company's statutes, the defendants were not entitled to require the Company to supply, and the Company were not bound to supply, the Chester Workhouse with water otherwise than by meter or special agreement; and (2) to recover £491 11s. 9d. on account of water supplied to the workhouse from Jan. 1, 1902, to the date of the writ, July 6, 1904. In the statement of claim, this sum was claimed as damages for wasting water passing through the meter at the workhouse. But the case had been argued on both sides, without objection, as if there had been an alternative claim for money due for water supplied by contract. He, therefore, treated the claim accordingly, but without prejudice to the defendants' rights under the statute mentioned hereafter. He held that he must, of course, treat the statement of defence as also amended so as to make the statute 22 and 23 Vict., cap. 49, sec. 1, applicable to the amended claim. His Lordship reviewed the circumstances under which the action had been brought, and said it was contended on the part of the plaintiffs that many of the purposes for which the water was required and used at the workhouse were not domestic, and that some were trade or business purposes; and that, even if the defendants were entitled, irrespective of section 22 of the Act of 1874, to a supply for domestic uses, to be paid for separate from a supply for other purposes, which was to be paid for in addition according to the statute, or by meter or special agreement, yet the section referred to prevented the Company from being bound to supply water to the workhouse otherwise than by meter or by special agreement, because a part of it was used for trade or business purposes. It was contended by the defendants that they were entitled to a supply of water for domestic purposes, though they admitted that for non-domestic or trade or business purposes they would have to make an extra payment, or pay by meter or special agreement; and, as they could not help admitting that some of the purposes were not domestic, they maintained that there would have to be separate supplies to meet the two sets of requirements, and that they would have to be paid for

on different bases. They did not, however, admit that any of the purposes were trade or business purposes; and therefore they said section 22 did not apply. Many decisions had been cited, and a number of points had been raised; but, in the view he took of the law and the facts, the real question lay in a nutshell. Most of the facts were undisputed; such controversy as there was turning upon inferences of fact rather than upon the facts themselves. With a great deal of the argument of Mr. Danckwerts for the defendants, he was in complete accord. For instance, the authorities showed that in cases arising under Water-Works Acts the nature of the purposes for which the water was required governed the rights of the parties rather than the nature of the premises to be supplied or the character of the occupiers. And he thought that, apart from section 22 of the Act of 1874, the defendants had a right to demand a supply of water to the workhouse for domestic purposes, payment for which was to be based on the annual value of the premises; and that they also had a right, subject to the provisions and restrictions of the Special Acts and of the Water-Works Clauses Acts, 1847 to 1863, to a supply for non-domestic purposes, including trade or business purposes, for which extra payment was to be made, according to statute, or by meter or special agreement. It was true, he thought, that great practical difficulties might arise in carrying out a double system, though this was denied by the defendants. But he could see nothing in the Acts (apart from section 22) to curtail the rights of the consumer in this respect; and he should certainly not differ from the opinion of Mr. Justice Buckley on this point in the case of the South-West Suburban Water Company. In his opinion, the present case turned wholly on the section he had named, no similar section to which was to be found in the Acts mentioned in any of the cases cited; and it might be that this section was introduced for the very purpose of avoiding the difficulty of a double supply. The first question was: Was this workhouse a dwelling-house? In his opinion, and so far as it was a question of fact, he found that for the purposes of these Acts it was—that was to say, the whole tenement, occupied as a whole by the defendants, and in respect of which they required water. An attempt had been made to say that it might be split up into several distinct dwelling-houses, and that the rights might differ as regarded the different parts. He did not think this point was raised in the pleadings; but, even if was, the contention was, in his opinion, untenable. The defendants' relations towards the plaintiffs depended on the ownership and occupation of the workhouse as a whole; and he thought the expression "or part of a house," in section 43 of the Act of 1857, referred to cases where there was a separate tenement by lease or otherwise. As to the workhouse being a dwelling-house, he was supported by the view taken by Mr. Justice Buckley in the case already cited, and also by the cases of *Lowe v. Lambeth Water-Works Company* and *Liskeard Union v. Liskeard Water-Works Company*. The next question was: Was any part of this dwelling-house used for any trade or business purposes for which water was required? He was of opinion, and he found as a fact, that the whole of it, and therefore each part of it, was used for business, if not for trade, purposes for which water was required. Mr. Danckwerts had said that this was only true if "business" was used in a loose sense, and that this workhouse was not used for business purposes within the meaning of section 22. But he (his Lordship) thought that, in construing similar statutes, similar institutions had been held to be businesses, especially by Mr. Justice Buckley in the case already cited; and if this, as a whole, was a business, all the water used, except what was employed for domestic purposes, was for the business. Moreover, he was of opinion, and he found as a fact, at all events, the dealing in pigs, for which part of the workhouse was used, and for which water was required, was a business, even if it was not a trade; and the use of the Lancashire boilers, and the various things done by them, including the heating of the wood-chopping shed, was a business. It was not necessary for the decision of the case to go *seriatim* through the different purposes for which water was required, and decide which were domestic and which were non-domestic, or whether any of them, besides those already dealt with, were trade or business purposes. Some were admitted to be non-domestic; and his opinion was that some of these were trade or business purposes, which brought the case within section 22 of the Act of 1874. That section did not contain the words "non-domestic purposes;" and this might be because there was no great difficulty in adding to "domestic" supply "non-domestic" supply (so long as it was not trade or business)—for example, a supply for gardens, fountains, &c.—payment for which could be easily added, while a trade or a business supply was much more difficult to combine with domestic supply as regards payment. For these reasons, he thought that section 22 did apply to the present case, and that plaintiffs were entitled to the declaration for which they asked. It remained to consider the relations of the parties at the date of the writ (July 6, 1904), as regarded the plaintiffs' right to recover damages for waste, or a sum due for water supplied. In the controversy, which was sufficiently shown by the correspondence, the defendants were, in his opinion, clearly wrong, even apart from section 22, in demanding that the meter should be removed, and that all the water should be used, as before, as a domestic supply for which payment should be based on annual value. According to the scale, this meant that they should have the same water as before, paying for it about £50 a year instead of about £200. And, further, if his decision as to section 22 was correct, they had no right, under existing circumstances, to demand a supply for domestic purposes at all on the basis of annual value, even if they were ready to pay besides for the non-domestic or business supply, which readiness, however, was not proved. On the other hand, he thought that plaintiffs put their case too high when they said that the old agreement was binding, and that the defendants could not get away from it. Their real case was that, if the defendants chose to go on taking the water as before, they were, by doing so, impliedly contracting to pay for it on the old terms. He thought, therefore, there was no case for damages for wasting water; but he found as a fact that the defendants took the water on the old terms by implied contract. He would give the plaintiffs, on the pleadings as amended, judgment (subject to verification as to amount) for £491 11s. 9d. as due at the date of the writ; but this again was subject to the defence of the statute. All questions as to requirements to prevent waste, &c., had been, by consent, postponed; and he thought it unnecessary to deal with this part of the case. Finally, there was the question of the Act 22 and 23 Vict., cap. 49, sub-sections 1 and 4. The first section *primâ facie* prevented any debt or demand from the Guardians of a Union being paid (and therefore from being sued for) except within the half year, as defined, in which it was incurred or became due, or within three months afterwards, subject to the extension by the Poor Law Board for a period not exceeding twelve months, which extension had not been obtained. But, by section 4, if any person claiming any debt or demand should have commenced, or should thereafter commence, proceedings in any Court of Law or Equity within the time limited, and should, with due diligence, prosecute such proceedings to judgment or other final settlement of the question, such debt was to be satisfied by the Guardians, notwithstanding that it might have been recovered, or such final settlement arrived at, after the expiration of the period. If the action brought on the 5th of July, 1904, was "a proceeding" within section 4, the Guardians could pay, and therefore would be bound to pay, the last quarter's water-rate, due June 25, 1904, which he was told amounted to about £58. But he thought the action, till amended by adding the alternative claim for the price of the water supplied, was not such a proceeding. The debt or demand for the price of the water was not, till then, sued for, either in the writ or in the statement of claim. The claim was quite different—namely, for unliquidated damages for waste of water; and this he had held could not be established. Therefore, the plaintiffs could not, in his opinion, recover even one out of the ten quarters of water-rate which would be otherwise due on July 6, 1904. The cases relied on by Mr. Randolph in order to show that there was no ascertained debt till he (his Lordship) had determined the principle, were wholly different from the present one, where an amount was due and payable, whether on a *quantum meruit* or otherwise liquidated. He therefore came most reluctantly to the conclusion that the plaintiffs were, by this statute, precluded from recovering any part of the £491 11s. 9d. sued for, and that, upon this part of the case, judgment must be for the defendants. But, as the plaintiffs had succeeded on the main question in the cause, and were entitled to the declaration they claimed, he did not deprive them of any of the costs of the action, especially as the defendants had been lucky enough, in consequence of the Statute, to obtain nearly £500 worth of water for nothing. His judgment, therefore, was for the plaintiffs for the declaration asked for on the claim, and also upon the counterclaim, with costs.

Disputed Monazite Sand Contract.

About two years ago, Mr. Justice Bigham had before him, in the King's Bench Division of the High Court of Justice, an action brought by the United Gas Improvement Company of Philadelphia against Mr. John Gordon, of South Audley Street, London, for damages for an alleged breach of an agreement in regard to the supply of monazite sand. After occupying the Court for several days, his Lordship, as reported in the "JOURNAL" at the time, gave only a partial decision, and certain points were left open. Since then the matter has been before him on various occasions; and as the parties were unable to agree upon the issues to be left to him, he decided to determine them for himself. The agreement chiefly in question was dated April 12, 1902, under which the defendant agreed to supply four German manufacturers of thorium with their "requirements" of monazite for a period of five years. Gordon was the owner of certain properties containing monazite sand deposits, which he assigned to the plaintiff Company for £275,000, of which £25,000 was paid on account; and he undertook not to export monazite to anyone but the Company. Shipments were duly made, and were disposed of by the Company. But later on the latter gave notice to Gordon that they did not intend to deliver any more. Thereupon Gordon made some shipments himself, so as to keep faith with the German firms. The point was whether the Company were entitled to require him to account for the profits resulting from these transactions, which were alleged to be shipments in excess of the buyers' requirements. This was decided a few days ago. His Lordship, having carefully considered the terms of the agreement, came to the conclusion that the plaintiffs had not kept to the terms of the agreement, and therefore had lost any remedy they might otherwise have had against the defendant under it. He therefore gave judgment for the defendant, with costs.

Stealing a Gas-Meter at Greenock.

In the Police Court at Greenock on Tuesday last, before Bailie Lemmon, John M'Laughlin, a fish hawker, and Peter M'Laughlin, a labourer, were charged with stealing a gas-meter and 15s. 4d. in money from the shop at No. 43, Vennel, Greenock, occupied by Bernard M'Laughlin. They pleaded "Guilty." The prosecutor described the charge as a serious one. It seemed, he said, that the two accused and a man named Currie made a resolution to enter the premises. Currie was known to M'Laughlin, and he got into the shop while it was being closed, and removed the bolt from the back door. The two accused subsequently entered by this back door, and took away a prepayment meter with the money in it. The gas escaped during the whole night; and when Mr. M'Laughlin's representative went to the shop in the morning he found he could not light the gas. He asked another man to assist him, and on a match being lighted an explosion followed, as a result of which the man who had come to assist was severely burned. One of the accused complained that as Currie was the man who opened the door, he too should have been charged. The prosecutor replied that his information was that Currie was not present when the theft was committed; that Currie certainly knew that the accused were in the shop, but, on the approach of a policeman, he disappeared. The two accused were sent to prison for 30 days.

The Montreal Light, Heat, and Power Company have declared a dividend for the three months ending the 31st ult. at the rate of 5 per cent. per annum.

MISCELLANEOUS NEWS.

PRESENTATION TO MR. AND MRS. ANDREW MACKENZIE.

On the occasion of the silver wedding of Mr. and Mrs. Andrew Mackenzie, the former of whom has been the representative of Messrs. Alder and Mackay, of Edinburgh, for the past quarter-of-a-century, a deputation of gas managers in Scotland waited upon them at their residence, Craig Dhu, Polwarth Terrace, Edinburgh, on the evening of Thursday last, the bearers of congratulations from, and of handsome presents subscribed for by, about 130 of the managers among whom Mr. Mackenzie's work lies. The presents consisted of a silver tea and coffee service, with a silver salver bearing the following inscription: "Presented to Mr. and Mrs. Andrew Mackenzie, by their friends in the Gas Profession in Scotland, on the occasion of their Silver Wedding, 4th January, 1907;" a gold and diamond pendant for Mrs. Mackenzie; and a gold and diamond scarf pin for Mr. Mackenzie.

Mr. W. BLAIR (Helensburgh), in a few well-chosen remarks, made the presentations.

Mr. MACKENZIE, in returning thanks on behalf of his wife and himself, said he could assure those present that when he was asked to go, as an apprentice, on the road, fully 25 years ago, he did not anticipate that he and his wife would be the recipients of such costly and beautiful gifts as those which had been bestowed upon them. While thanking the donors, perhaps it would be right to say a few words about the friends of the past. He had been thinking of the vast changes which had taken place in the gas profession in Scotland. During the last 25 years there had been fully sixty removals by death. When he started travelling, he did not know many gas managers; but he could never forget the kindly interest shown in him by Bailie Robertson, of Bathgate, on whom he called the first day. There were a number of gentlemen still living who were managers then. There were four who had retired—Mr. Smith, of Hawick, Mr. MacPherson, of Kirkcaldy, Mr. Whimster, of Perth, and Mr. Caithness, of Carnoustie. There were, he thought, almost twenty still in office who were gas managers then, some of them then over the Border. Among these were Messrs. Blair (Helensburgh), Fairweather (Kilmarnock), Hislop (Paisley), Carmichael (Barrhead), Smith (Ayr), Wilson (Coatbridge), Sinclair (Rothesay), G. Taylor (Jedburgh), Napier (Crieff), Robertson (Dunoon), W. Taylor (Forres), M'Allan (Turriff), Ross (Burntisland), Ewing (Greenock), Galbraith (Ardrossan), Deans (Johnstone), J. N. Myers (Saltcoats), C. P. Myers (Troon), and Scott (Markinch). There were, he thought, only four now in the situations they held when he started. These remarks showed how numerous had been the changes going on around them; and yet, amid them all, he and his wife had the satisfaction of knowing that they were still surrounded by many friends. He sincerely trusted Providence would grant that their friendships with each other might long continue.

The company were hospitably entertained by Mr. and Mrs. Mackenzie, and a pleasant evening was spent.

THE EXPLOSION AT THE DUBLIN GAS-WORKS.

The Cause of the Accident.

Last Tuesday, Dr. Louis Byrne, the City Coroner for Dublin, held an inquest on the body of James Sherwood, an employee of the Alliance and Dublin Consumers' Gas Company, who was injured, with a number of others, at the Company's works in Brunswick Street—by the explosion of which some particulars were given in the "JOURNAL" last week, p. 168—and who died in Sir Patrick Dun's Hospital on the 13th inst.

Mr. GERALD BYRNE represented the Company; and Mr. JOHN JACKSON, one of the Inspectors of Factories, was in attendance.

Dr. *T. O. Graham*, the House Surgeon at the hospital, deposed that deceased was admitted at 11.30 a.m. on the 10th inst. in a state of collapse resulting from severe burns caused by an explosion of a purifier at the gas-works. He was detained, and never rallied—dying on the 13th inst., from shock.

Mr. *G. F. A. Waterfield* said he was Assistant-Engineer to the Company. On the previous Thursday morning, about five minutes past eleven o'clock, he was underneath the purifiers on the oxide floor with D'Arcy, who had charge of them. Witness left him shortly afterwards, and was walking down the yard when he heard a rumbling noise. He proceeded in the direction of the sound, and on his arrival at the purifiers he saw flames issuing from the oxide hoppers of No. 4 purifier. He immediately had the gas shut off from all the purifiers, had the retort-lids opened, and the carburetted water-gas plant shut down. He then saw the Chief Engineer, who had just arrived, and informed him of what he had done. All the purifier valves were closed so as to isolate each purifier.

Mr. *W. F. Cotton*, jun., the Company's Chief Engineer, stated that on the morning of the accident he was telephoned for by the Chairman of the Company (Alderman Cotton) to see him at the head office; and after doing so he returned to the gas-works. Just as he arrived, he saw some injured men being removed on drays and waggons. He ordered the Fire Brigade ambulance to be telephoned for, and then obtained particulars of what had happened, which were to the effect that the purifiers were on fire. He ran in the direction of the house, and on his way met two men—Thomas Cummins and Michael D'Arcy—who appeared to be injured. The Medical Officer (Dr. L. J. Farrell) was fortunately on the works and was looking after the injured, and witness requested him to at once get Cummins and D'Arcy off with the others to the hospital. On reaching the purifier-house, he saw at the south or coal gas end a great volume of gas burning underneath; and he at once inquired if all the valves leading to and from the purifiers were closed. He was informed that they were with the exception of one, which he then closed—thus leaving the purifiers absolutely isolated from the other parts of the plant. The Fire Brigade and the ambulance arrived promptly. Witness noticed that the two oxide discharging hopper doors in the bottom of No. 4 purifier were open, and that fire was coming from them. They were closed by the commander of the Fire Brigade (Captain Purcell) and by witness's assistant; thus confining the fire to one box, which burnt out by four o'clock in the afternoon.

In answer to the CORONER, witness said that, as the Company's Chief Engineer, he was responsible for the working of the station. He inspected the place several times daily, and he was frequently visited by the representative of the Home Office, who was present, and who had never pointed out anything which should be done that had not been attended to. He had examined the place since the accident, and had formed an opinion as to the cause of it.

The CORONER: Will you state briefly what your opinion is?

Witness: I carefully examined the place, and I have come to the conclusion that there must have been a leakage from one of the hopper doors. As to how the gas took fire, I should say there must have been a spark, which might have been caused by the hopper door opening, when it might strike the bottom of the purifier, which would be sufficient to cause a spark. At the time the accident happened, we were using the electric light; and if there was a defective wire, that also might have caused a spark, which would have been sufficient to cause the gas to explode.

There was no naked light?—There was none at all there. The nearest naked light would be about 200 feet away.

Why have you the electric light now in use?—About four years ago, there was an explosion in England. Up to that time we had been in the habit of working with a naked gas-light, and I asked my Board to substitute electric lights, which they did.

You considered that was a safer light?—Yes.

What means are there of ventilating this place?—On one side the purifier-house is completely open, and on the Canal Basin side we have ten open ventilators 4 feet square.

Can there, therefore, be any collection of gas there?—There might be a little between the boxes.

Replying to Mr. GERALD BYRNE, witness repeated that the Inspector of Factories had never made a suggestion which had not been attended to. The purifiers were open on all sides but one, and were raised about 16 feet from the ground. There was no roof. Everything had been done to have the best equipment and regulations for the safety of the workpeople.

Mr. JACKSON (to the Coroner): There have been three explosions in England, and the Home Office has recently drawn our attention to the question of purifying-houses. With regard to this particular place, it largely complies with the recommendations made by the Home Office; but I wish to ask the witness some questions.

The CORONER having acquiesced,

Mr. JACKSON then put to the witness a series of questions, which elicited the information that he knew the use of miners' safety-lamps had been condemned, that such lamps had been used at Saltley, Coventry, and Manchester, and that the Home Office had directed that electric torches should be substituted for them. After the Manchester accident, he did not make any alteration in the position of the purifiers to avoid explosion. The boxes were formerly on the ground; but ten years ago they were raised 16 feet so as to get better ventilation.

Mr. JACKSON: Can you suggest anything that would cause the hopper door to open?

Witness: It might not be properly fastened, or the lever may have slipped.

But even if it was only partly open, some gas would have leaked?—Yes.

And did one of the wires pass under the centre of the box where the explosion took place?—Yes; between the two doors.

So that if the gas were leaking, and these wires fused, it would be quite sufficient to cause the explosion?—It would.

The CORONER (to Mr. Jackson): Were you satisfied that the purifiers were in sufficiently good order?

Mr. JACKSON: Before the explosion, I should have said "Yes;" but since then, in view of what happened, I would recommend ventilation between the purifiers.

But up to that time you were satisfied that they were complying with the requirements of the Home Office?—I should say the arrangements were more satisfactory than in the majority of other places, because it is often the habit to put up brick buildings, and when an explosion occurs in one of these more people are hurt or killed by the heavy buildings falling upon them than by the explosion itself. That was the case at Saltley; and I am satisfied that, if there had been such buildings here, out of the seventeen men who were injured very few would be alive to-day. An improvement can be made by having hand electric lamps with a dry battery instead of the wires, which I think were the cause of the accident. I gather that the Company are doing this now.

Witness said that was so. They had, in fact, already got them.

Mr. GERALD BYRNE expressed the sympathy of the Company and everyone connected with it with the families of the poor men who had been hurt. He said he was sure the Coroner and the Jury were aware that the Company always took care to look after such cases, and they would certainly do so in this.

The Jury returned a verdict to the effect that death was due to shock resulting from burns accidentally received at the gas-works, and added a rider recommending the widow of the deceased and his children (of whom there are five) to the kind consideration of the Company.

All the injured men are doing well, and there are now only six in the hospital.

The text of a Bill has been published to enable the Municipal Commissioners of Singapore to borrow $8,145,410 for the construction of water-works, to be divided as follows: $650,000 for the extension of filters, $3,834,460 for the Kalang reservoir and land, and $3,660,950 for the Selitar works

GAS MATTERS IN BIRMINGHAM.

In moving the adoption of the report of the Gas Committee at last Tuesday's meeting of the Birmingham City Council, Alderman Sir Hallewell Rogers referred to the efforts that had been made to get rid of the difficulties which arose by the deposit of naphthalene in the distributing-mains and service-pipes. He pointed out that the trouble occasioned a great deal of inconvenience to the consumers; and in 1900 several thousands were spent in the endeavour to find some remedy. No substantial result was, however, achieved; but more recently a method had been adopted which had succeeded in reducing the number of cases of defective supplies consequent upon the deposit of naphthalene from 23,520 in 1905 to 519 during the current year. There had been no diminution in the gas supply for the present year. Both for lighting and cooking, gas appeared to be in favour, especially with the small householders, as instanced by the large number of prepayment meters supplied during the past twelve months. The Committee were, he said, again, on the advice of Counsel, applying to the Railway Commissioners for a review of the charges made by the Railway Companies for the conveyance of coal from Derbyshire and other districts to the Saltley Gas-Works.

After the resolution had been seconded, Mr. Lovsey made some allusion to the robberies from prepayment meters. He remarked that he had been informed that the officials compelled the consumers to lose the money, and also to make good the damage done to the meters. He suggested that the meters should be placed in less accessible positions. He also protested against the indicators at the top of the meters being of German manufacture.

Replying on these points, Alderman Sir Hallewell Rogers said the landlords decided where the meters should be fixed; the Committee's only stipulation being that they should be as near the front as possible. When the consumer was asked to pay for the damage to the meter, it was the damage to the cash-box part of it which was referred to; and this, of course, the Committee would expect the consumer to pay. With regard to the other matter, the order was given to a Birmingham firm; but the Committee could not be sure that every part of the meter was of English manufacture. He agreed with Mr. Lovsey that, where they could have English-made goods, they ought to have them.

The report was adopted.

GAS AND ELECTRICITY IN MARYLEBONE.

The Recent Failures of Electric Light—Removal of Gas-Lamps.

At the Meeting of the Marylebone Borough Council on Thursday, the Electric Supply Committee presented a long report on the recent failures of the electric light in Oxford Street, and stated that steps were being taken to prevent a recurrence of the interruptions. The report was adopted.

Mr. DUNN took exception to the following paragraph in the Lighting Committee's report: "We have given notice to the Gaslight and Coke Company to discontinue the supply of gas to the public lamps in Oxford Street, and have directed the Borough Surveyor to remove the whole of the gas-lamps and columns therein." He asked what was the reason for this haste. Common prudence would, he said, have dictated, in view of the two recent failures, to keep an alternative supply, in case of accident, at least for some little time. Ratepayers were now saying that the decision to remove the gas-lamps was a "burning of the boats," so that the electric light would have to be used, no matter how dear or how unreliable it turned out to be, because of the great expense involved in reinstalling gas. What guarantee was there that the electric light would not fail again next week?

Alderman MORRIS said it appeared to him that the action taken with regard to the removal of the gas-lamps was premature.

Alderman ANGLIM remarked that the gas-lights were so small that they would be of no use if the electric light failed.

A COUNCILLOR: They lighted the street for a good many years.

Mr. RICHARDS said the Council themselves did not trust the electric light, for there was a gas-chandelier in the Council Chamber where they were now sitting.

Mr. DEBENHAM, the Chairman of the Electric Supply Committee, said it was merely for ventilation.

Mr. RICHARDS went on to say that no one trusted the electric light; for in theatres, public buildings, and churches gas was also laid on. At dinner parties at his house, they had been plunged in darkness owing to the failure of the light.

Rev. J. A. BEAUMONT, alluding to the statement that the gas-chandelier in the Council Chamber was only there for ventilating purposes, said the gentleman who made it evidently was not aware that he (the speaker) and other members of a Committee would have been in the dark, on one occasion alone, for 25 minutes but for the chandelier. When those to whom gas was so obnoxious were considering how further to extend the electric light, he hoped they would bear this in mind.

Mr. E. T. FOWLER, the Chairman of the Lighting Committee, said the gas lamp-posts were being removed because they were an obstruction. The Consulting Electrical Engineer was confident that the electric light could now be relied upon.

After some further discussion, the report was adopted.

The Electric Supply Committee recommended that all consumers under the new rates whose accounts exceeded £50 per quarter should be allowed a discount of 25 per cent., provided the accounts were paid monthly within ten days of rendering.

Mr. DEBENHAM explained that the electric undertaking was feeling the severity of the gas competition.

Mr. HARPER objected to this further concession to large consumers. He said the policy seemed to be to squeeze the small consumer. He was paying more this year than last for the electric light.

Mr. KNIGHT said it appeared to him that they were fast approaching the stage when all ratepayers would have to pay the greater part of the cost of lighting the premises of big consumers in Oxford Street.

In the result, the recommendation was carried.

THE GAS INDUSTRY IN THE FIFTIES.

In the last issue to hand of "Progressive Age," there is an article by "S. A. G." containing some reminiscences of the gas industry in America half-a-century ago. He remarks that the manufacture of carburetted hydrogen gas was primitive then in comparison with the modern process now in use. The gas engineer of those days was a much more important personage than the present one. He was the sole authority for contracting and managing. Gas-works contractors did not furnish their own plans and specifications; they were merely bidders on the engineer's plans. The offices of the secretary and other officials were merely clerical positions; they had very little authority. Great secrecy and mystery pervaded the entire business, and there were no gas journals nor gas associations to publish information. The prices of gas ranged from $5 to $6 per 1000 cubic feet, and gas was used for illuminating only. Gas-ranges and gas-stoves were unknown.

Gas was made by carbonizing coal in iron retorts; 4 cubic feet per pound being the maximum obtained from Youghiogheny coal. After being driven off, the gas was washed in round iron box washers, condensed in pipe condensers, and purified with slaked lime; this process giving a heavy, rich gas of 18-candle power, and the only bye-products being coke and coal tar. The back-pressure maintained on the iron retorts was from 10 to 12 inches; and, as exhausters were not in use, the retorts soon became choked up with graphite, and had to be renewed, on an average, every twelve months. When clay retorts came into use, and high heats were employed in water-gas generators, the gas industry was materially changed.

Among the first gas-works built in the West were those at Cincinnati, Ohio, erected in 1841. The capital was furnished by Mr. J. H. Cauldwell, of New Orleans, who was owner of the St. Charles Theatre; the amount of capital being less than $100,000. He continued President of the Company until his death. The present capital of the Company is about $100,000,000, and a proportionate ratio of increase continues in the various companies throughout the country—showing a marvellous increase in volume of a product unknown a century before.

Meters used in the West were wet ones, filled with an anti-freezing fluid, requiring considerable attention, and having to be replenished with this fluid at short intervals to keep the water-line correct. The first consumers' dry meters used in the West were shipped from England from the factory of Mr. Thomas Glover in 1856, and consigned to the Cincinnati Gas-Works.

Many extra charges were also in vogue at that time; among them being the following: Meter-rent, 25 c. to 50 c. per month; service-pipes, 15 c. to 25 c. per lineal foot; stopcock for meter connection, $2·50; wood meter-box, $1·50; turning gas on again for delinquent customer, $1. Extensions and improvements were made from accumulated profits, and extra stock issued to cover the cost, increasing the market value of the stock to an extraordinarily high figure.

The foregoing reminiscences are a few notes from the memory of bygone days; the writer having been an employee of a gas company in 1851. Being still engaged in the gas industry, he is impressed by the progress that has been made in half-a-century; and he presented the few facts he has recorded for comparison with present conditions.

THE TRAINING OF GAS-FITTERS IN GERMANY.

A paper was read by Herr Heineken, of Bremen, before the last meeting of the Lower Saxon Association of Gas and Water Engineers, upon the classes for the training of gas-fitters which are now becoming common and highly popular in many parts of Germany.

The gas industry has made such rapid strides of late years that a dearth of men competent to superintend the manufacture of gas has made itself felt; but the same remark applies with even greater force to men thoroughly acquainted with the methods of fitting up indoor consuming plant and of laying down street-mains. The need for skilled men in both branches has been most acute in the eastern parts of Germany, where it has frequently happened that gas-works have been built to supply towns in which no capable fitter was to be found. The school in Bremen, already described in print, did not originally include in its curriculum any courses for fitters; but when the harm done to the gas industry in Eastern Germany through the absence of good workmen came to the notice of the Prussian Government about 1903, they sent officials to study the training methods adopted in the Bremen institution, which then felt it desirable to inaugurate special training for men in the distribution department.

With the aid of the information collected in Bremen, a gas-fitters' school has been founded in Posen as part of a general trade school already in existence there. The enterprise is greatly encouraged by the Government, which goes so far as to offer the students payment to the amount of 2s. or 2s. 6d. per day during the period of the classes, in recompense of the wages they lose, together with return railway fares to the place where the classes are held. Lectures are delivered in the mining school at Posen, and practical work is done in a shop belonging to the municipal gas undertaking—the head fitter of the works acting as superintendent under the direction of the teachers. Exactly similar courses are held at Bromberg under the same leadership, where the instruction lasts for three weeks, covering the subjects of gas, water, and low-tension electric mains. As many as 75 students have attended the courses at a time—necessitating the classes being held in duplicate. Training on the same lines is also given at Liegnitz for the province of Silesia, where the students have numbered 55; while the Trades Unions in Breslau, Liegnitz, and Oppeln, and the Silesian "Gewerbeverein," in conjunction with the Prussian Ministry of Trade and Commerce, have instituted four-week courses for gasmakers at Breslau on the Bremen pattern. The fees are 30s.; but poor men may enter free, and receive a sum of £3 to £6 for their expenses.

The school at Bremen has now been enlarged so as to give instruction to fitters also. The course is wider than elsewhere, covering every branch of constructional work in the domain of apparatus for the

consumption of gas. This has necessitated expensive equipment, the total value of which is about £250. The materials used in each course cost nearly £15. Many large makers of gas-fittings, however, have made handsome contributions of apparatus and material to the school. At the present time, 35 students can be provided simultaneously with material and tools. They work under the supervision of one teacher and two foremen or demonstrators; lectures being delivered in the Technical School at Bremen, and the practical work being done partly there and partly in a shop belonging to a firm in the town. During 1906, 71 students attended the classes for gasmakers, and 38 those for gas-fitters.

Quite recently a somewhat similar training establishment has been founded at Cologne. The course for gasmakers is four weeks shorter than at Bremen—lasting only for three months; whereas the course for fitters is considerably longer. The fees are only half as high at Cologne as at Bremen, and the new school is only arranged for the reception of 15 students.

BRADFORD WATER-WORKS LOANS.

Last Thursday, Mr. F. J. Willis, on behalf of the Local Government Board, held an inquiry at Bradford, with reference to the application of the Corporation for a Provisional Order to partially repeal, alter, or amend the Local Acts relating to the water undertaking, so as to fix a uniform period for the repayment of loans.

In his opening statement, the Town Clerk (Mr. F. Stevens) said that the application was to provide for an equation of the period for the redemption of the debt on the Corporation water-works. Money had been borrowed from time to time under various Local Acts; and it seemed desirable that steps should be taken for a simplification of the accounts, which were at present very complicated. For some years, the charges for interest and sinking fund had been increasing very rapidly—largely accounted for by the expenditure of money on the Nidd Valley works. The outlay involved, roughly speaking, an annual sinking fund of £18,000, and interest amounting to £31,000. The interest and sinking fund on all the works was £148,000; and to meet the burden it would be necessary for the Corporation to resort to a rate-in-aid, or to increase the price of water for trade purposes. It was proposed to get over the difficulty by spreading the charges over a longer period, which would involve no hardship on future ratepayers, as the works would last for at least a hundred years. It was proposed that the Local Acts should be altered so as to provide for the equation and consolidation of the loans over a period of sixty years. The debt to which the equation would apply was £2,998,781. It did not include the debt they took over from various Local Authorities. To meet this, they had a sinking fund of £109,889. Part of the debt was debenture stock and part short-term loans. About £831,201 was for short-term loans, and £2,159,580 was debenture stock, some portion of which was redeemable at fixed periods. This portion was £1,854,995; while the stock that bore no fixed date for redemption amounted to £304,885. It was proposed that a number of clauses in the Bradford Water-Works Acts of 1854, 1855, 1858, and 1862 should be wiped out; and that there should be inserted in the Provisional Order asked for a clause similar to that contained in the Bradford Corporation Gas and Improvement Act, 1871, empowering them to apply all moneys received in respect of water (1) in payment of the cost of raising and recovering the water-rates and borrowed moneys, (2) in payment of interest, (3) setting aside the sinking fund, (4) in management and maintenance charges, (5) in improvements and extensions, and (6) in any manner which the Corporation might deem best in the interests of the ratepayers. But whenever the income was insufficient for any of the purposes mentioned, the deficiency should be charged upon, and be payable out of, the city fund and rates. The effect of the last clause would be to empower the Corporation to apply any surplus from trading departments in relief of the water charges.

The Water Engineer (Mr. James Watson), in reply to a question by the Inspector as to the durability of the works, said that some of them ought to last hundreds of years. They had reservoirs which were sixty-five years old, that were better to-day than when they were built. The dams were of masonry, and the aqueducts of masonry and concrete. Some portion of the money would, of course, represent water-mains; but the bulk of the expenditure was in reservoirs and aqueducts.

The scheme was explained at length by the City Treasurer (Mr. G. A. Thorpe), who stated that during the proposed period of sixty years, the income would assuredly increase; so that after the lapse of seventy or eighty years there would be a profit of at least £12,000 a year, assuming the income was stationary. But as the population increased, so would the income from the water-works, and at the end of sixty years, there would be a large fund which could be used for the benefit of the inhabitants of Bradford. There was nothing in the whole scheme that would not commend itself to business men. It would equate the city burden; and the value of the works would be as great in sixty years' time as it was to-day.

THE NEW WATER SCHEME FOR LEEDS.

The proposed Bill of the Leeds Corporation—providing, among other things, for the abandonment of the old site of the Colsterdale reservoir, and the construction of another reservoir higher up the Burn Valley, Masham—which has twice been assented to by a majority of the members of the City Council, was exposed last week to the ordeal of the statutory meeting of ratepayers. The various sections of the Bill were taken separately; and that referring to the water scheme was passed almost unanimously by the sixty or seventy persons present.

In moving the resolution, Mr. Herbert Brown, the Chairman of the Parliamentary Committee, recalled the circumstances under which it was decided to alter the site of the Colsterdale reservoir—explaining that the estimated cost of the old reservoir was £932,007, with a daily supply of 9,469,813 gallons of water, while the estimated cost of the new reservoir was £436,800, with a daily yield of 8,149,029 gallons. The Corporation were, he said, endeavouring to provide an adequate supply of water for an increasing population. In 1906, the daily supply of water to Leeds had been 15,749,672 gallons, while the supply to outside places brought up the total to 16,232,954 gallons. The daily supply available from the present watershed was 16,500,000 gallons. In 1911, it was estimated that the city would require a daily supply of 18,025,596 gallons, which would be 1,525,000 gallons in excess of the present available quantity; and the estimated daily demand in 1916 was 19,474,660 gallons, or 2,974,668 gallons in excess

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 205

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20½–21½	..	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14–15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾–7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5–5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- } 10 p.c.	28–29	..	4 16 7
51,810	10	,,	7	mouth Gas } B 7 p.c.	17–17½	..	4 0 0
53,200	10	,,	6	and Water } Pref. 6 p.c.	15–16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262–267	+2	4 13 8
300,000	,,	,,	9½	Do. New	200–205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101–104	..	3 16 11
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	232–237	+2	4 14 11
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163–168	..	4 18 3
460,000	20	Sept. 27	10	British	41–43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121–125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91–94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½–12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24–26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9–9½	–¼	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50–52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96–98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½–110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110–113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107–110	..	4 10 11
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83–85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124–127	..	5 2 4
200,000	,,	,,	7	Do. 7 p c. Pref.	138–143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105–107	..	3 14 9
486,090	10	July 27	11	European, Ltd.	24½–25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18–19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas- } 4 p.c. Ord.	101–102	+1	4 6 3
2,600,000	,,	,,	3½	light } 3½ p.c. max.	89–91	+1	3 16 11
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	107–110	..	3 12 9
4,193,975	,,	Dec. 13	3	Coke } 3 p.c. Con. Deb.	84–86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98–103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118–121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½–20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	178–180	+½	4 8 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95–97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120–125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110–112	..	3 11 5
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	227–229	..	4 7 4
718,100	,,	,,	7	Do. B	167½–165½	..	4 3 1
144,140	Stk.	Sept. 13	7⅝	Maidstone 5 p.c.	145–150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼–4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101–103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101–103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½–12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110–111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96–97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20–21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½–14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150–155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6–6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7¾–8¼	+¼	4 6 2
796,980	5	July 27	5	Do. 5 p.c. Pref.	5¼–5½	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼–12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95–97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13¼–13¾	..	5 16 5
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48–50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248–250	..	4 0 0
209,984	,,	,,	10	Do. B	248–250	..	4 0 0
523,500	,,	,,	10	Do. C	248–250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½–16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128–130	..	4 4 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84–85*	+½	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	156–158	..	5 1 3
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123–126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123–126	..	3 19 4
112,533	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125–130*	½	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	105–110	..	4 10 11
120,000	Stk.	Aug. 30	6½	Tottenham } A 5 p.c.	27–130	..	5 0 0
388,020	,,	,,	5	and } B 3½ p.c.	104–106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton } 4 p.c. Deb.	101–103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½–11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102–104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106–108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- } A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth } B 3½ p.c.	140–145	..	4 9 8
75,000	,,	,,	5⅝	and } C 3½ p.c.	113–115	..	4 17 6
79,416	,,	Dec. 28	3	Putney } 3 p.c. Deb. Stk	79–82	..	3 13 2
779,875	,,	Aug. 15	5⅝	West Ham 5 p.c. Ord.	103–105	..	4 17 7
185,000	,,	,,	5	Do. 5 p.c. Pref.	120–123	..	4 1 4
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102–105	+1	3 16 2

Prices marked * are "Ex div."

of the present available supply. Obviously something needed to be done; and the only alteration they proposed to make in the scheme of 1907 was to move the reservoir higher up the valley.

The proposal was seconded by Mr. Fred Ogden, the Chairman of the Water Committee, who pointed out that facts which came to light after the passing of the Bill in 1901 indicated to the Council that the scheme which had been decided upon was not the best that could be carried out. The present proposal aimed at remedying the defects discovered. In the matter of quantity of supply, the new scheme would be nearly as good as the original one; while in regard to cost, it would be much better.

There was some discussion, in the course of which Mr. J. Dransfield, the Elective Auditor, though not altogether against the scheme, prophesied that the cost would be a great deal more than the estimate.

NORTHAMPTON WATER SUPPLY.

Completion of the Ravensthorpe Well.

The members of the Water Committee of the Northampton Corporation, accompanied by three officials, drove over to Ravensthorpe a short time ago to examine the new well which has lately been completed. When it was decided to sink a well in close proximity to the reservoir at Ravensthorpe, it seemed absurd to some, who regarded it as probable that the water from the reservoir would percolate through to the well. But beneath the reservoir is a bed of impervious clay, so that fears on this account were not justified. This was proved by a trial shaft which was sunk to a depth of 90 feet, where the water had accumulated so rapidly that the suction-pipes had to be fixed beneath its surface. A tunnel was then commenced to tap fresh streams, and the work was continued for about 259 feet. Another shaft was therefore sunk (to a depth of 87 feet) some 300 feet from the end of the tunnel in a straight line; and from this end another drive was commenced which was ultimately to break into the former one. It was quite possible that when the two tunnels met there would be 30 or 40 feet of water, so the old heading was stopped with a 12-feet concrete wall, through which a pipe was driven, to safeguard the workmen. The new tunnel was started on the 26th of July; and the water-bearing strata were reached by the 26th of September, when 81 feet had been dug. The last 6 feet took three weeks to sink owing to the men having to work practically in a circular waterfall; indeed, something like 169,000 gallons of water were falling each day. The first difficulty of magnitude, however, was experienced when the tunnel merged into a fissure 6 ft. 6 in. wide. This was filled up with mud, &c., and a platform built. On this were placed bags of cement, which were forced up, making what was a weak spot one of great strength. The work was then carried on to completion. The full length of the tunnel is 562 ft. 3 in. It runs from north to south, and practically in a parallel line with the dam of the reservoir. Altogether, it is a very ingenious piece of work, and is highly creditable to its designer, Mr. Frank Tomlinson, the Water Engineer and Manager to the Corporation, who carried out the work.

The work has entailed an outlay of £4560, included in which sum is upwards of £600 for machinery. Valuing this at one-third its cost, the expenditure is £4360, of which £900 has been swallowed up in sinking the second shaft, which was not included in the original estimate submitted to the Local Government Board. This leaves at £3460 the cost of the work estimated for to the Local Government Board. The loan was for £3500. The only tender received amounted to £1200 more than the work has been done for; and this did not include sinking the second shaft. Had the whole been done by contract, the Engineer estimates that it would have cost £10,652. Having regard to the quantity of water pumped from the well, a comparison of cost is interesting. The cost of the reservoir was £126,000, and the Billing Road well cost the Water Company £24,000. The new well is not quite complete, though it can now be worked to supply the town. Beyond it, practically everything is of a temporary nature. It is anticipated that the proper machinery, which, it is said, will be more economical to use than the existing set, will cost about £6000; so that the total outlay on the work will be something like £10,000 or £12,000. Nothing, however, will be done in the way of getting new plant until the well has been adequately tested, so that the yield may be gauged. It will be used until the reservoir overflows; thus ensuring for Northampton a never-failing supply of water of great purity.

Reinstatement of Footways in Paddington.—The Paddington Borough Council have adopted the following charges per square yard in connection with the reinstatement of footways and carriage ways when disturbed by public companies and authorities other than the Post Office: 1-inch asphalte paving on 4-inch concrete, 14s.; 1½-inch do. on 6-inch concrete, 17s.; 1½-inch do. not on concrete, 12s. 6d.; 1½-inch lithofalt asphalte on 6-inch concrete, 17s.; 2-inch asphalte on 6-inch concrete, 19s.; 2-inch do. not on concrete, 14s. 6d.; concrete only, 1-inch thick, 1s.

Proposed Pension Scheme at Oldham.—At a recent meeting of the Oldham Gas Committee, the General Manager (Mr. Arthur Andrew) suggested that they should take into consideration the establishment of an old-age pension scheme for all the employees in the Gas Department. There were, he said, many men at present working there who had attained a good age; and rather than live on the charity of others, they were struggling on for subsistence. The Chairman (Alderman Hanson) said they could not consider the question then. Mr. Andrew remarked that they had as many old men in their department as in any other department of the Corporation. The matter would have to be started somewhere. The Chairman said that they might consider the question at the next meeting of the Lighting Sub-Committee; and Mr. Andrew was instructed to lay before the Lighting Committee some particulars regarding the proposal.

TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

For the

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Scottish Junior Gas Association—Eastern District—had before them, at their quarterly meeting in Edinburgh this afternoon, two communications of an instructive nature; the first being a description, by Mr. Henry Rule, Assistant Gas Manager at Falkirk, of the stoking machinery in use in the Corporation Gas-Works there, and the second a lecture on "Suction Gas Producers," by Mr. John T. Wight, Assistant in the Heriot-Watt College, Edinburgh, to Professor Stanfield. The second communication, being a lecture, was not open to discussion. The first was; but the remark is common to both, that neither was suitable for discussion. They were descriptions of apparatus, dealing with matters of fact, which cannot be controverted. If Mr. Rule had had time to go more fully into his subject, which we all know he unfortunately had not, having the full responsibility thrown upon him of the management of the Falkirk Gas-Works during the present vacancy, he might have given more working results than he did, and then members could well have compared them with those obtained by other methods of stoking. All that could be done was simply to ask a few explanatory questions; and these were frankly answered by Mr. Rule. The excellence of the paper cannot, therefore, be judged by the amount of discussion which took place upon it. Its value lay in the information given of the construction and methods of working of the plant. A fuller description could not have been desired; and in this connection commendation must be made of the series of beautiful diagrams by which the paper was illustrated. Mr. Wight's lecture was a comprehensive one, dealing with almost every type of suction-gas plant in the market, pointing out where they varied, and the advantages claimed for each. The lecture was an admirable one; but its good effect was greatly marred by the failure of the lantern to show the slides. It was lighted by electricity, and the only comment upon its working which would be at all near the truth would be that when it was not in a condition to make a clear figure upon the screen it was out altogether, the periods of total darkness most tantalizingly occurring, for the most part, at the points where it fell to the lecturer to deal with some more than ordinarily important items of arrangement. This was the only blemish upon the meeting. In spite of it, there was a great deal learnt about the working of suction gas-engines. A word as to the figures given by the lecturer as results. These may be accepted as accurate, so far as they go; but they are sadly incomplete as a means of judging as to the respective duties of engines driven by producer and by town gas. There are many elements to be taken into consideration besides those enumerated, such as the first cost and upkeep. Before a manufacturer could, with anything like reliability, decide as between the two powers, he would require a much more exhaustive comparison.

In the Hamilton Town Council on Tuesday, it was reported that a claim for damages had been made upon the Corporation, in respect of injuries sustained by a gas consumer through an explosion of gas in his house. The Manager reported that the meter had been wilfully tampered with; and it was agreed to repudiate liability for the claim, and to raise a counter-action for the damage done to the meter. Bailie Meechan called attention to the bad quality of the gas which was at present being supplied to consumers; and Bailie Hamilton, the Convener of the Gas Committee, in reply, while admitting that there had been a few complaints, said that one complaint was made at that table, and that when the Gas Manager went to investigate it he was refused admittance. Generally speaking, the complaints were found to be due to lack of proper attention to the fittings and burners. Bailie Meechan said he considered that gas ought to be manufactured that could be used with flat-flame burners. Bailie Hamilton, on the other hand, considered that they must go along with the times, and not lag behind. A report by the Manager—Mr. J. Ballantyne—was submitted, in which he stated: "With regard to the smells from the gas-works, these are not caused by the working of the sulphate of ammonia plant, and the plant was not working on the date specified. The complaints, to a great extent, evidently arise from quenching coke with the waste liquor, and so long as this practice is continued, there will always be a certain smell peculiar to the operation. So far as the present arrangements allow, this has been reduced to a minimum by pumping a certain amount of the liquor into the quarry, and diluting the remainder with clean water before it is used for quenching the coke. . . . With reference to bad gas, it will be remembered that when the coal supply was purchased last May, it was pointed out that the quality would be reduced from half-a-candle to a candle; and this is what has actually taken place. The question of quality simply means whether we are to cater for the old-fashioned, and now to a great extent antiquated, form of flat-flame burners, which have done duty for the last eighty years, or supply a gas suitable for the modern incandescent burner. Most of the complaints, however, seem to be from those using incandescent burners, in which case it is either owing to the want of a proper supply of gas, or the burners not being properly regulated, or using mantles unsuited for the particular kind of burner. Of late I have been using more cannel, and less soft coal, to obviate these complaints; but it is quite well known that it is only a question of time, and that not very long at the best, till there will be little or no cannel coal to be obtained, and then consumers will be compelled to use a gas of inferior quality. An effort was made, some four years ago, to get the local tradesmen to take up the matter of keeping incandescent burners in repair, and cleaning them periodically, as these burners require a little more care and attention than flat-flame ones to obtain the most satisfactory results; but all the negotiations fell through, as the tradesmen did not seem prepared to take the matter up." The minutes of the Gas Committee were adopted; and it was agreed to circulate literature giving instructions as to the use of incandescent burners among the consumers.

In the Lanark Town Council on Monday, the Town Clerk reported that notice had been given of the Council's having adopted the Burghs Gas Supply (Scotland) Acts, and that there had not been any remonstrance from any ratepayer. The confirmation of the adoption of the Acts will

RADIATOR PICTURES, No. 14.

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Wrights the Radiator People.

COLSTON HALL. BRISTOL.

now be proceeded with. The Council sat in private to consider the report by Mr. W. R. Herring, of Edinburgh, upon the condition of the gas-works and plant; but it is understood that no formal decision was come to.

A question having been raised in the Dunfermline Town Council on Monday as to the quality of gas for power purposes, Bailie Stewart, the Convener of the Gas Committee, said that the following questions had been sent to the makers of gas-engines whose engines were in the town: (1) Whether gas made from common coal, and enriched with benzol to 21-candle power, is as good for gas-engines as common coal gas, enriched with cannel to 21 candles? (2) Which gas will develop the greater power, apart from price? (3) How the change of gas and the change of price from 3s. 2d. per 1000 cubic feet to 2s. per 1000 cubic feet should have raised or lowered gas accounts for gas-engines? One firm replied: (1) "Gas made by you, and enriched with benzol, is equally as good for gas-engine purposes as gas previously enriched with cannel; (2) the maximum power of a gas-engine will be about 4 per cent. less with the benzol-enriched gas than with the cannel-enriched gas, apart from the price per 1000 cubic feet, or the quantity of gas used; (3) there should be 40 per cent. decrease in the gas account for gas-engines by the change in explosive value and change in price of gas which your Commissioners have made." Mr. Waddell, the Convener said, did not claim a 40 per cent. decrease; but he said that the gas for power purposes was equal to anything required. The replies received from the makers of gas-engines should be even more favourable now, because since the letters were received the price of gas for power purposes had been reduced to 1s. 9d. per 1000 cubic feet.

On Thursday, the 9th inst., a meeting of the Directors of the Girvan Gaslight Company was held in the office of Mr. Tait, the Secretary to the Company, and, after the conclusion of the ordinary business, the Directors agreed to visit and inspect the improvements at the gas-works, which, during the past eight months, have undergone a wonderful change. The retort-house walls have been raised all round, a new roof has been put on, and a new bench, containing three ovens and retorts, built by Mr. Workman, of Saltcoats, including ironwork; a horizontal steam-boiler, by Penman and Co., of Glasgow, has been put in; a new scrubber and exhauster house has been erected; a new Bryan Donkin exhauster to pass 10,000 cubic feet per hour has been put down; also one of Clapham's patent scrubbers, with 8-inch connections; a Tangye tar-pump, with 3-inch connections; a new tar-tank to contain 7000 gallons; a new lime-shed, new office, new store, and new weigh-bridge, &c. The Directors, who were accompanied by their respected Gas Manager, Mr. Thomas Watson, having examined the works, expressed appreciation of their tidy appearance and general management, which they said reflected great credit on the Engineers, Messrs. Fairweather, of Kilmarnock. The total cost of the work was only about £1300.

On Tuesday, the Gas Committee of the Falkirk Corporation, out of the forty applicants for the post of Gas Manager, selected the following as a short leet: Messrs. J. Lang, of Fraserburgh, Thos. Lighbody, of Renfrew, A. M. Smith, of Darwen, J. M'Leod, of Glasgow, W. Wilson, of Kirkintilloch, A. Mackay, of Montrose, and G. Keillor, of Broughty Ferry.

An action has been called in the Court of Session, before Lord Salvesen, at the instance of the Edinburgh and Leith Gas Commissioners, against the Kinneil Cannel and Coking Coal Company, Limited, of Glasgow. The nature of the action has not been disclosed; but it may be said that the Company do not supply largely to the Commissioners.

A pleasant little ceremony took place in the house of Mr. Andrew Mackenzie, of Messrs. Alder and Mackay, in Edinburgh, on Thursday evening, when presentations were made to Mr. and Mrs. Mackenzie on the occasion of their silver wedding. Mr. Mackenzie is known to all gas managers in Scotland, and to many out of this little kingdom, as a most faithful and energetic representative of his firm, and also as an entertaining companion and attached friend; and it was in both capacities that his friends in the gas profession honoured him and his lady. I believe that such a presentation is unique in the history of the gas industry in Scotland. Mr. Mackenzie's popularity in the circle of his acquaintance is shown by the number of gas managers who contributed to the presentation.

At the Buckhaven Town Council, on Monday, Mr. Cormie said he thought the time had now come when the Council ought to consider the advisability of the burgh doing its own lighting. They were at present served by two Gas Companies—the Leven and the East Wemyss (one on each side of the burgh)—and the rates charged were very high as compared with Alloa, where the price was 2s. 1d. per 1000 cubic feet. He thought they should have municipal control of the gas undertaking. It was agreed to ask the East Wemyss Gas Company to erect two lamps, to enable the Council to judge as between their efficiency and that of the two electric lamps which have been offered by the Wemyss and District Tramway Company.

Gas Stoker's Death at Newcastle.—At an inquest on the body of William Watt, a gas stoker, evidence was given to the effect that while he was employed at the Newcastle and Gateshead Gas Company's works, some few weeks ago, he slipped and fell. He had since been medically attended; and the doctor attributed death to paralysis, due to hemorrhage on the brain, caused by a fall. The jury returned a verdict of "Accidental death."

Rural Water Supplies in Lincolnshire.—An inquiry has lately been held, on behalf of the Local Government Board, at Billinghay, into an application made by the Sleaford Rural District Council for sanction to borrow £10,750 for the purposes of a scheme of water supply for several of the parishes in the district. Dr. Giles, the Medical Officer for the district, said that South Kyme, one of the parishes in the scheme, obtained its main supply of drinking water from the River Slea, which received the undiluted sewage of Ruskington and various other sewage pollutions. During the last twenty years, there had been many cases of typhoid fever due to drinking water from the river. Half the houses in Martin, another of the parishes, were without any water supply. The samples of drinking water he had analyzed were badly polluted.

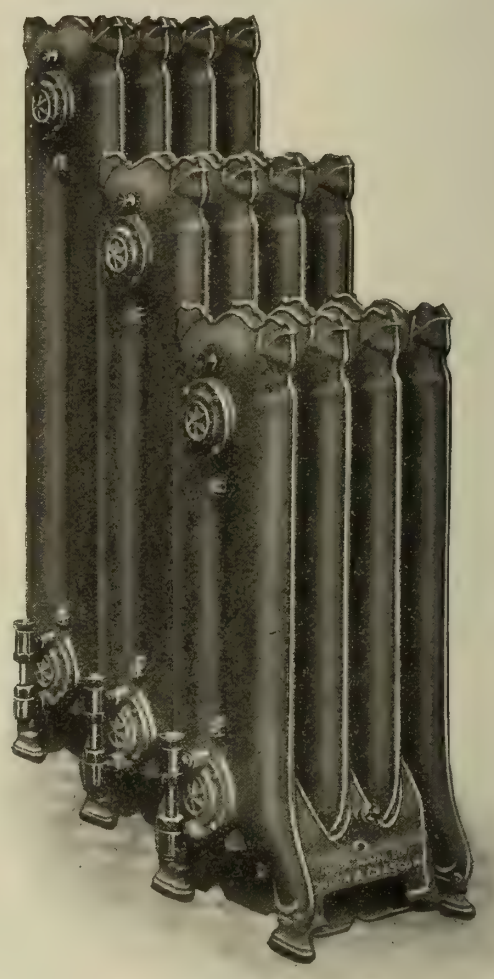
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Fitted with Automatic Gas and Air Valves and Cast-Iron Stands.

Full Price List on Application.

R. & A. MAIN, LTD.,

LONDON, GLASGOW, FALKIRK, &c.

CURRENT SALES OF GAS PRODUCTS.

Week ending Jan. 19.

There has been a good deal of activity in London tar products during the last week or two. The lower price for pitch has brought in many buyers, and important sales are reported for the second half of this year at much better prices than some recently-recorded sales for prompt delivery. This is of importance, and should prevent distillers from making heavy sacrifices unnecessarily. The present value is 27s. to 27s. 6d. net, with a very good demand for both prompt and forward. Ninety per cent. benzol is from 1s. to 1s. 1d. net. Solvent naphtha is much stronger, at 1s. 9d. to 1s. 10½d. net, casks free. Ordinary creosote is 2¼d. to 2½d. net. Sulphate of ammonia is much firmer, with a stronger demand. Beckton terms may be called £12 5s. to £12 7s. 6d. over the next three months.

LIVERPOOL, *Jan.* 19.

Sulphate of Ammonia.

The week opened with a quiet market, but towards the close there has been improvement at all points. Buyers who have hitherto been hanging back have recognized that the level of prices is favourable for buying, and have been covering their requirements more freely; so that at the close the quotations are £11 15s. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. There has also been more inquiry for spring delivery, but, as buyers' views are not much above spot prices, while makers are looking for a premium of 7s. 6d. to 10s. per ton, business has been very limited in this position.

Nitrate of Soda.

This article is quiet, but spot prices remain 11s. 3d. per cwt. for 95 per cent., and 11s. 9d. for refined.

LONDON, *Jan.* 19.

Tar Products.

There has not been very much business doing in tar products during the past week. Pitch is quiet; business having been done at 24s. on the east coast. It is reported in Liverpool that 23s. 9d. was accepted for prompt delivery, and an offer to place some quantity at 24s. Manchester was unsuccessful. The London value remains about 25s., though something under this would have to be accepted if prompt shipment was required. There has been a little business doing in both South Wales and on the Continent for delivery to June, but at very low prices. Creosote is very firm, though in London there is some quantity selling for prompt delivery at low figures. In the North, however, manufacturers refuse to quote; while in the Midlands they ask 2¼d., and even at this figure will only submit small quantities. Solvent naphtha is not quite so firm; and it is reported that some quantity was offered on the east coast at 1s. 1½d. for delivery from now to the end of June. Benzol, 90 per cent., also is easier—1s. having been accepted in London for a small quantity; while much lower prices are prevailing in the North. 50-90 per cent. is steady; business having been done in the Manchester district at equal to 11¾d. per gallon. Carbolic acid is certainly quieter. Manufacturers have accepted 1s. 8d. for delivery on their works to the end of June; while it is impossible to obtain more than 1s. 8½d. on the east coast. Crystals are unchanged in value, though a certain amount of business is reported to have been done at market prices. The market for toluol is steady; but nothing of importance has transpired, and values are unaltered. There is no business to report in anthracene.

The average values during the week were: Tar, 13s. to 17s. Pitch, London, 24s. 9d. to 25s.; east coast, 24s. to 24s. 3d.; west coast, 23s. 6d. to 24s. 6d. Benzol, 90 per cent., 11½d. to 1s.; 50-90 per cent., 11⅝d. to 11¾d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 3½d.; heavy naphtha, 1s. 3d. to 1s. 5d. Creosote, London, 2d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £5 to £9; salts, 34s. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market has been decidedly firmer during the past week. In London, the principal Gas Companies maintain their quotations of £12 2s. 6d. for prompt, and £12 5s. for forward; but business is reported to have been done in outside makes at a distinct advance upon last week's figures. In Hull, business has been done at £12 for prompt and forward, though in the case of the prompt, it was a very fine make that was offered. In Liverpool, business is reported to have been done at £11 17s. 6d. for prompt; while a small quantity was also sold at this figure for February-March, which was certainly cheap, as nothing under £12 would receive any consideration to-day. In Leith, buyers have offered £11 17s. 6d., but without success; and makers, being well sold, do not appear at all disposed to quote.

Poole Water Arbitration.—The arbitration to determine the price to be paid by the Poole Corporation for the undertaking of the local Water Company will be held in London early in March; and the proceedings are expected to extend over two or three days. The Arbitrators are Mr. Henry Rofe, M.Inst.C.E., on behalf of the Corporation, and Mr. G. R. Strachan, M.Inst.C.E., for the Company; while Mr. Ram, K.C., will act as Umpire.

Quality of the Oystermouth Water Supply.—In a report which has been discussed by the General Purposes Committee of the Oystermouth Urban District Council, the County Medical Officer of Health expresses his surprise that the Council have not taken up the question of water supply in earnest, and he states his belief that there are no signs that they intend to do so, "until an epidemic visits the district, and plays havoc with the inhabitants." Mr. Rees asked why the County Council, who were above the District Council, did not take the initiative; but the Clerk replied that it was not their duty to do so. He added that the Council could buy out the Water-Works Company; but this would very largely increase the rates. It was decided to send to the Company a copy of the County Medical Officer's report.

THE "BLAND" LIGHT IN CHURCH.

ACTUAL FACTS

ST MARY'S HOUSE.
ROSS.

4th Jany 1907

Dear Sirs

I have to day received from the Ross Gas Co. the amount of Gas consumed in Ross Church during Xmas Quarter 1906.

The success of the Bland Burner has exceeded my expectations.

The Saving on this quarter alone has been 33,400 ft. to the value of £6. 13. 7.

Yours Truly

Xmas Qr. 1905
Naked Burners 65. 200

Xmas Qr. 1906
Bland Light 31. 800

33. 400.

During the whole of this past quarter we have not received a single complaint or gloom.

Yours faithfully
W. Watkins

Churchwarden Ross Parish Church

For full details respecting the "Bland" Light for
CHURCH, FACTORY, SHOP, & DOMESTIC LIGHTING,
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BLAND & CO., 63, Queen Victoria St., London, E.C.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There is a good demand for all kinds of coal in the Lancashire district. The miners are working full time. The recent increase in prices offers no bar to purchasers. Contractors are eager to enter into negotiations for six and twelve months' supplies. Contracts for fuel are made at all times during the year, and there are terminals occurring monthly. Buyers opening new contracts for burgy and slack from the end of January will have to pay an increase of from 10d. to 1s. per ton. There has been quite a sensational rush for shipping coal of late, both for bunkers and for export. It is stated that one colliery proprietor near Manchester, a few days ago, had to decline, from general pressure, a proffered order for 2000 tons of coal for export. Coalowners are sanguine that if the present satisfactory outlook continues, prices will show a further advance in the near future. Cannel, as well as gas coal, is on the rising scale. The average quotations are: Best house coal 14s. to 15s. per ton, secondary 13s. to 14s., common 10s. to 12s., burgy 8s. to 9s., best slack 7s. 3d. to 7s. 9d., medium 7s., common 6s. to 9s. 6d., coal for bunkers and export 10s. to 11s., and furnace coke 17s. to 24s.

Northern Coal Trade.

The coal trade is very firm; and though the output is full, it is well taken up. For early delivery, however, there is some difficulty in arranging purchases. Prices have thus advanced rather sharply; and the tendency appears to be still upwards. In steam coals, best Northumbrians are now quoted as high as 13s. 3d. to 13s. 6d. per ton f.o.b., second-class steams are about 12s., and steam smalls are from 7s. 6d. to 8s. 6d., while forward sales seem numerous, with higher prices in some cases. In the gas coal trade, there is a keen demand, though the deliveries on the long contracts now begin to show signs of lessening. Durham gas coals vary more in price, as sales are now being made for delivery over the shipping season. Current quotations for gas coals vary according to the quality, and are from about 11s. 3d. to 12s. 6d. per ton f.o.b. The contracts for Copenhagen are now definitely settled; and the quotations are about 15s. 9d. to 17s. per ton, free at Copenhagen—the latter price being estimated to leave 12s. 4½d. to 12s. 6d. per ton f.o.b., according to the allowance that is made for the freight. It is a sharp rise on the price that was paid last year, when allowance for the past tax is made. Coke is very firm; but gas coke seems to be offered more plentifully. The quotation varies from 12s. 6d. to 13s. 6d. per ton f.o.b. on Tyneside.

Scotch Coal Trade.

Trade remains steady—outputs going off freely, and prices being well maintained. The export trade has not yet recovered the buoyancy it had before the New Year; but the outlook is hopeful. The prices quoted are: Ell 10s. 9d. to 12s., splint 12s. to 12s. 6d., and steam 10s. 3d. to 10s. 6d. The shipments for the week amounted to 180,861 tons—an increase of 83,074 tons upon the preceding week, but a decrease of 11,596 tons upon the same week of last year. For the year to date, the total shipments have been 278,648 tons—a decrease of 16,470 tons upon the corresponding period of 1906.

Bath Gas Company and Local Ironmongers.—At a recent meeting of the Bath Ironmongers' Association, a satisfactory report was given by Mr. W. C. Lee of his interview with the Engineer and Manager of the Bath Gas Company (Mr. C. Stafford Ellery), who had agreed that the retail price of certain gas-stoves should be the list quotation, less 5 per cent. for cash and 10 per cent. to gas-fitters.

Damages for a Gas Explosion.—At the Omagh Quarter Sessions, a man named Colton, and his wife, obtained £25 damages from the Omagh Urban District Council for injuries done to their house and furniture by a gas explosion last November. The accident was caused by an escape of gas from a pipe under the house. The total damage was estimated at £36 18s.; and the Council (who own the gas-works) offered £20 and costs.

Cutting-off Water for Non-Payment of Rates.—The St. Pancras Borough Council have received a letter from the Metropolitan Water Board with reference to the disconnection of supplies for non-payment of the water-rate, stating that it is not considered advisable to entirely abandon the practice; that the power to cut off supplies has been very sparingly used; that no supplies are disconnected without the order of the Board's Committee being first obtained; and that it has been the practice to refrain from giving such orders where the premises are known to be occupied by more than one family, and in genuine cases of poverty. During the half year ending Michaelmas last, out of a total of nearly 1,100,000 supplies, only 213 were actually withdrawn. Of these, 132 were merely turned off at the stopcock; leaving only 81 cases where a physical disconnection was made. In this period, the number of supplies disconnected in St. Pancras was five.

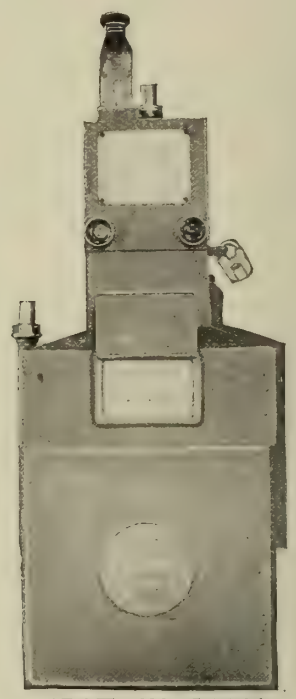
Gas Lighting Matters in Lambeth.—The Lighting Committee of the Lambeth Borough Council report that the cost of the conversion of the public lamps in the Gaslight and Coke Company's district to the incandescent system has been paid off. The work was carried out in 1903-4 at a cost of £2044 4s. 11d., which was lent by the Company for three years without interest. The Council will now reap the full benefit of the reduced cost of lighting as compared with the flat-flame system. The Baths and Cemetery Committee report that they have been compelled to partially revert to gas lighting in the public wash-houses, as it was found impossible to keep the electric incandescent lights in good order owing to the steam. It has been decided, when the baths completion works are considered, to provide arc lamps in place of the electric incandescent lights. As, however, it will only be possible to keep these lamps alight when the Council's engines are running, and as it is necessary at times to have another means of lighting in case the electric light fails, the Chief Engineer has been directed to utilize the old electric light standards for gas supply; and the work is now being carried out. Incandescent gas-burners have been placed in the West Norwood Library, in substitution for the gas-lights which were previously there.

ALWAYS FIRST

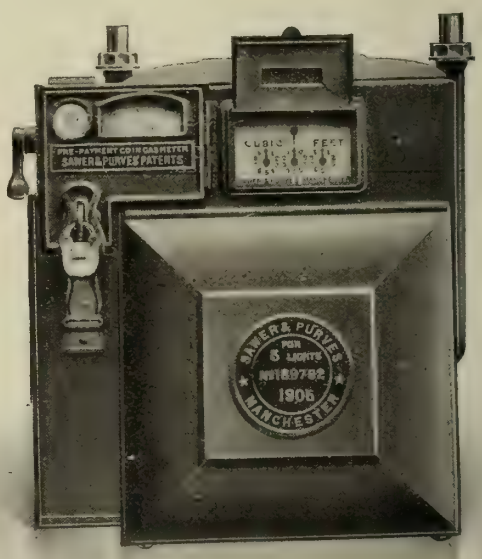
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FOREMOST 1906.

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MANCHESTER & NOTTINGHAM.

Coal and its Bye-Products.

There was a large and appreciative audience at the Stockton Literary Institute last Wednesday night, to hear a lecture by Mr. Matt Dunn, the Assistant-Manager of the Corporation Gas-Works, upon "Coal: Its History and Bye-Products." The lecture was the continuation of a previous one delivered before the members on "Coal: Its Formation and Uses." After giving a brief synopsis of his previous lecture, Mr. Dunn dealt at considerable length with the history of coal; tracing our knowledge of it to the present time, and dealing not only with England, but with Greece, China, Italy, Egypt, Asia Minor, and other countries. Following up the historical aspect of the subject, he dealt with the extent of the existing coalfields in this country, and referred to those at present untouched, but available for future use. Estimating the total quantity, he pointed out the seriousness of the export trade. The quantity exported had increased from about 9 per cent. in 1857 to over 25 per cent. now. The available coal supply of the country would probably last for 400 years, but in another 50 years the coal available would be so deep, and the cost of winning it so great, that it would be possible and probable for foreign coal to be imported and sold at a less price. Giving the proportions of coal used in various ways, he stated that 8 to 10 per cent. was utilized for gas making, 30 to 40 per cent. for iron smelting, and upwards of 25 per cent. was exported—the remainder being consumed in factories, houses, locomotion, and other ways. The residual products of coal were dealt with most exhaustively; the lecturer's remarks being graphically illustrated by various plants, including a miniature tar-distillation plant. There was also exhibited a large collection of tar products. The lecture was illustrated by numerous lantern slides; and at the close a hearty vote of thanks was accorded to Mr. Dunn.

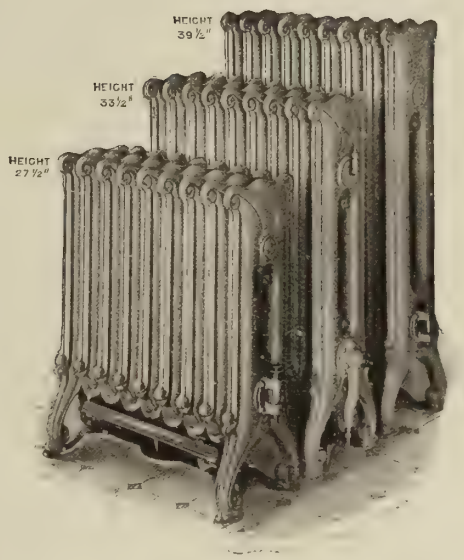
Automatic Light Controlling Company, Limited.

At the first ordinary general meeting, last Thursday week, of the British, Foreign, and Colonial Automatic Light Controlling Company, the Chairman (Sir Edward P. Wills, Bart.) said the Directors felt they had every cause to congratulate the shareholders. It would be within the knowledge of most that the Company was formed to acquire the business of the Automatic Light Controlling Company, which had been established at Bournemouth for five years, and which transferred its valuable patent rights, agreements, benefit of contracts, &c. Notwithstanding the many difficulties inseparably associated with the removal of the Company to Bristol, the revenue from sales and hiring agreements had during the past twelve months realized a highly satisfactory sum. The turnover had yielded a profit sufficient—after charging the Managing-Director's and Secretary's salaries, Directors' fees, depreciation upon controllers on hire, and one-third of the formation expenses—to provide for a dividend upon the preference shares, and leave a disposable balance of £771. The Directors were determined to build up an adequate reserve fund; and they were therefore prepared to add to the above-mentioned balance the amount of their fees already charged—£400. Of the £1182 thus available, they proposed that so much of it should be transferred to the general reserve fund as would bring the fund up to £1300, and that the balance then remaining be carried forward to the current year's account. The system of automatic lighting and extinguishing of lamps—both electric and gas—was imperfectly understood by the public. Was it for one moment realized that the adoption of this Company's system would, in a city the size of Bristol, mean a saving to the ratepayers of many thousands a year—a saving effected not only in the expense of labour, but also in the decreased consumption of gas? At a moderate estimate, the rates might thus be reduced by nearly 1d. in the pound. Many cities had already availed themselves of the system; and he felt that it was only for its capabilities to become well known, for all great towns to adopt what was clearly proved to be a large saving to the community. Already negotiations were opened for the working of the patents in France and Germany. The Managing-Director (Mr. John Gunning) said the system was already in use in Brighton, Chesterfield, Carlisle, Dover, Darlington, Eastbourne, Folkestone, Maidstone, Neath, Newcastle-on-Tyne, Oxford, Poole, Queenstown, Salisbury, West Hartlepool, Yeovil, and many other places of importance in the British Isles; besides, Melbourne, Napier, Maidstone, Dunedin, Ballarat, Christchurch (New Zealand), and St. John's (Newfoundland), in the Colonies. The report was adopted.

Hull Corporation Bill.—The Town Clerk of Hull has received a requisition for a poll of the citizens on the Corporation Bill; and it will be taken towards the end of the month. The poll has been demanded on all the proposals, and not only on that dealing with the purchase of the undertaking of the East Hull Gas Company.

Municipal Electricity Supply at Woolwich.—Following on the report of Sir Alexander Kennedy on the Woolwich electricity undertaking, to which reference has already been made in the "JOURNAL," comes the report of the Auditor, which is said to be one to alarm the ratepayers. The Chairman of the Finance Committee (Dr. T. A. Ingram) recently stated that, so far from having a working balance of from £2000 to £10,000 (as provided in the bye-laws), the Council were faced with an overdraft of £60,000. Of this sum, £42,000 represented capital expenditure on electricity supply. The accounts of the department were in such a state that neither the late nor the present Council could apply for a loan, because they did not know on what the money had been spent, and could not allocate it to its proper account. The only way he could see of clearing off the overdraft was by an increase in the rates of (say) 6d. or 8d. in the pound. Remarking on the position, a correspondent of "The Times" says: "There can be no doubt that the financial situation in Woolwich is exceedingly serious, and that the continued loss on the Electricity Department is mainly responsible for the present position of affairs. Every unit sold means further loss; and, as an indication of the policy adopted by the Labour majority in the last Council, it may be pointed out that the price for current to the private consumer is less than that charged for current for street lighting."

RICHMOND'S RADIATORS



1. "A Marvel."

"Merchant of Venice." Act 2—Scene 6.

2. "The Gem of All."

"Hamlet." Act 4—Scene 7.

3. "Goodly Things without Contradiction."

"Taming of the Shrew." Act 1—Scene 1.

4. "Very Excellent Piece of Work."

"Taming of the Shrew." Act 1—Scene 1.

5. "Workmanship and Value."

"Cymbeline." Act 2—Scene 4.

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON, &c.

Cheap Gas for Power at Mansfield.—The Mansfield Gas Committee propose that the following scale of charges shall be adopted with reference to the use of gas for engines only: Under 50,000 cubic feet per quarter, 2s. 2d. per 1000 feet; over 50,000 and under 100,000 feet, 2s.; over 100,000 and under 150 000 feet, 1s. 9d.; 150,000 cubic feet per quarter and over, 1s. 6d. These rates are intended to come into operation from March 31.

Private Bill Business for Next Session.—Last Wednesday was the final day for depositing memorials complaining of non-compliance with Standing Orders in the case of the petitions presented for Bills for next session. Only one relates to a measure in which our readers are interested, and it is the memorial of the Llantrisant and Llantwit Fardre District Council and others in respect of the petition for the Ogmore and Garw Urban District Council (Water Supply, &c.) Bill.

London County Council's Book-Keeping.—Mr. Holt Schooling, the well-known statistician, has made a remarkable criticism of the London County Council's methods of account-keeping in a report he has compiled on the Council's finances. "During my 26 years of actual experience in scrutinizing the accounts of many different organizations," he writes, "I have never met with any set of accounts that so notably lack lucidity and inter-related accuracy as these accounts of the London County Council."

Additional Capital for the Chigwell, Loughton, and Woodford Gas Company.—Last Tuesday, Mr. Alfred Richards sold, in accordance with instructions received from the Directors, a new issue of £3000 of consolidated ordinary stock of the above-named Company. It ranks for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; and the interim dividend on the Company's existing similar capital for the half year ending the 30th of June last was at the rate of 5¼ per cent. per annum. The prices realized ranged from £105 to £110 10s. per £100 of stock.

Guiseley Water Purchase Question.—The Guiseley Urban District Council, at a special meeting in committee, have decided to offer the Guiseley Water Company £12,000 for the whole of their undertaking, subject to the conditions that the Company give a guarantee in writing to accept the offer, to transfer to the Council the agreement at present existing between them and the Yeadon Water Company, and also to pay the costs of conveyance to the Council. The offer is, of course, also subject to the approval of the Local Government Board and of the ratepayers of Guiseley. The Company's Directors, subject to the approval of the shareholders, asked £12,000 for the works; so that the only difference between the parties is the cost of the conveyance.

Saltash Water Supply.—The difficulty caused by the leaking of the main laid on the bed of the River Tamar, to which reference was made in the "JOURNAL" last week, has caused the Saltash Town Council to consider other schemes for conveying water to the town from Plymouth. Last week the Council met in committee, and considered a scheme by Mr. H. Bulteel, of Plymouth, to lay a 5-inch steel main across the Royal Albert Bridge. It is proposed to put the main between the railway line and the side of the bridge, and to cover it, reduce the pressure of the water to 90 lbs. per square inch, and provide sluices at both ends of the bridge, so that the water can be cut off in case of accident. The Great Western Railway Company are to be asked for the terms on which they will allow the main to be laid. An amendment to the effect that a consulting engineer should be called in to consider the whole question of the water supply of the town, was defeated; and the Council were also opposed, on the ground of cost, to a suggestion that steps should be taken to obtain a water supply from the Cornish side of the river.

Curious Gas Suffocation Case.—A strange gas fatality has occurred at Merryhull Hall, the property of the Birmingham and several other Boards of Guardians. The Works Foreman, named Willetts, slept in the place last Thursday week; but on the following morning he did not get up as usual. The caretaker went to his room; and receiving no answer to his knock, he called to another man, and the two entered the room. A strong smell of gas was then noticed; and Willetts was seen lying dead on the floor near a gas-fire. A gas-jet was burning, but the stove jets were not; and investigation proved them to be turned off. A gas-fitter named Sparkes subsequently examined the whole of the fittings of the room, and found them in proper order. At the inquest, Dr. Parsey testified that death was due to suffocation through inhaling gas. Sparkes advanced the theory that when putting out the stove deceased accidentally turned on one of the taps. He would probably go to sleep, but would be awakened by the effect of the inhalation of the gas, and would get out of bed to try the gas-taps. The escaped gas would be very dense near the floor; and inhaling this, he would be overcome. The Coroner supported this conjecture; and the Jury returned a verdict of "Accidental death."

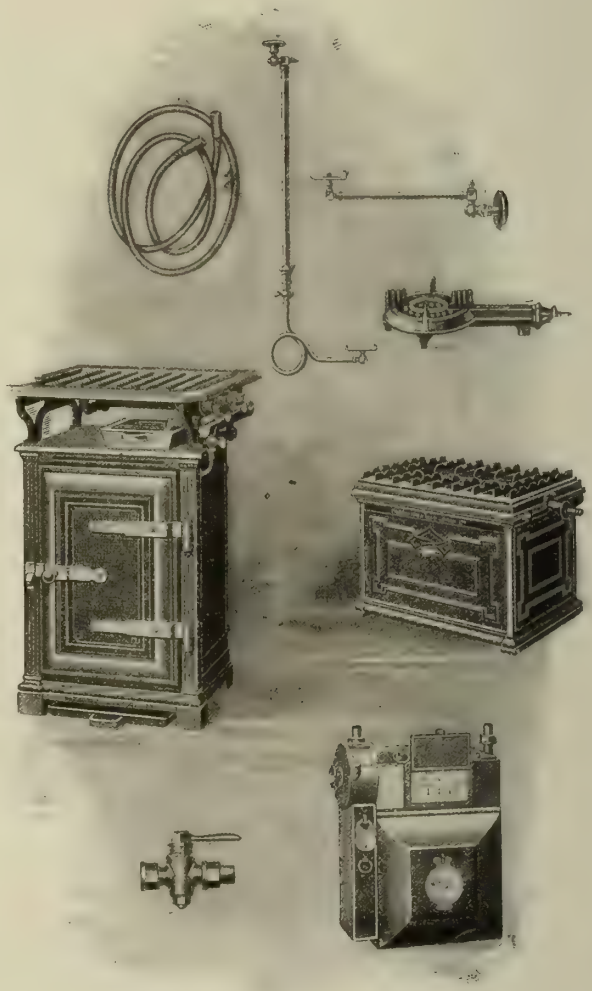
The Electric Light Standards in Oxford Street.—The Hon. Secretary of the Roads Improvement Association (Mr. Rees Jeffreys) recently addressed a letter to the Local Government Board, drawing attention to the row of electric standards being erected in Oxford Street between the Marble Arch and Oxford Circus. He pointed out that standards in the middle of the street had been found in practice to be a source of danger to the public, and had been condemned by the Royal Commission on London Traffic. Other districts in London which had in years past erected such standards were now removing them. For example, the borough of St. Pancras had recently been at considerable expense in taking down the central electric standards which obstructed the road between the Portland Road Station and Tottenham Court Road. On behalf of his Association, therefore, he asked the Board to make representations to the Marylebone Borough Council on the subject. Mr. Jeffreys has received a reply from Mr. H. C. Monro, one of the Assistant-Secretaries of the Board, to the effect that the matter is not one in which they have any authority enabling them to intervene. In sending the correspondence to the papers, Mr. Jeffreys writes: "The matter furnishes another illustration of the great and urgent need for the establishment of a permanent Traffic Commission for the Metropolitan area, on the lines recommended by the Royal Commission. There are over 90 independent and uncontrolled highway authorities in the Metropolitan Police district."

PARKINSON'S

COMPLETE

SLOT

INSTALLATIONS.



PARKINSON AND W. & B. COWAN, LTD.

(Parkinson Branch),

Cottage Lane, City Road, LONDON.

Bell Barn Road, BIRMINGHAM.

Sulphuric Acid Manufacture at Bradford.—The Bradford Gas Committee are about to recommend the Council to spend £3250 in extending the sulphuric acid plant at the Frizinghall Chemical Works. It is stated that at present the Committee are only utilizing about half of their total quantity of spent oxide in the manufacture of sulphuric acid; but the enlargement of the plant will permit of all being made use of, and will practically double the output of acid.

Gas Suffocation Case at Banbury.—A young girl who entered domestic service at Banbury on Monday of last week, was found dead in bed the following morning with the room full of gas. At the inquest, the mistress explained that the gas-bracket had two arms, from one of which a small piece of tubing was suspended. There were thus two taps, one of which was found turned half on. The Coroner suggested that the piece of tubing should be removed from the bracket, as it was possible that the hand of deceased, after she turned out the gas, caught against the tubing and touched the other tap, turning it partly on. The Jury found that the cause of death was suffocation by an accidental escape of coal gas.

The European Gas Company have announced an interim dividend of 5 per cent.

The Directors of the Brentford Gas Company recommend dividends at the rates of 5, 12½, and 9½ per cent. per annum for the past half year, carrying forward £53,306.

A movement is on foot among the owners of gas coal pits in Nottinghamshire and Derbyshire to form themselves into an Association, with a view to reducing competition and maintaining prices at regular levels.

Messrs. A. E. Podmore and Co. have just issued a catalogue (arranged in a convenient form for the pocket) of their dust and insect proof burners, self-intensified lamps, pendants, and other specialities for outside and interior lighting. It is artistically got up, and will be useful to managers when calling upon consumers with reference to alterations in, or new installations of, lighting appliances.

The Vale of Leven Gaslight Company, with its office in North Street, Alexandria (N.B.), was registered in Edinburgh last week. The capital is £27,250, in shares of £5 each, for which the public are not asked to subscribe; and the object is to manufacture and sell gas for any purpose within the county of Dumbarton or elsewhere.

The Richmond Gas Stove and Meter Company's gas-steam radiators have just been installed in the Tivoli Theatre, Dublin, and in Covent Garden Theatre, London. Other places of importance recently fitted with their radiators are: St. James's Court, Buckingham Gate, S.W.; St. George's Church, Kensington; St. James's Church, Paddington; Christ Church, Harlesden; and Victoria Hall, Kensington.

A public meeting has been held at Brough, near Kirkby Stephen, to consider the new scheme of water supply from Ravenstonedale, and the suggested apportionment of the cost (estimated at £8500) over the several interested parishes. There was strong opposition to the proposal, on the ground of the great expenditure involved; and on a show of hands being taken, the meeting voted unanimously against the scheme.

A scheme has been prepared for supplying water to Accra from the Adjementa Valley, in the neighbourhood of Aburi, on the Gold Coast. It was anticipated that the carrying out of the scheme would have been commenced during the past year; but the prolonged drought of the last three years has caused doubts to be felt as to the sufficiency of the original scheme, and a special expert is to inquire into and report on the whole subject, after personally examining the various sources of supply.

In an address on the Leicester Gas Department, Councillor Edwards stated that they used 1000 tons of coal a day, employed 1300 men, owned 90 miles of mains, and had 50,000 customers. When the undertaking belonged to the Company, the price of gas was 2s. 10d. per 1000 cubic feet; to-day it was 2s. 4d., while no charge was made for meter-rent. In another 32 years, the profit on the undertaking would be £100,000 per annum, which, with the profits from the other municipal concerns, would mean that Leicester would be a free rated town.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER (SMALL WORKS). No. 4702.
DRAUGHTSMAN. No. 4703.
GAS ACCOUNTANT AND COLLECTOR. Nantwich Gas Department. Applications by Jan. 31.
WORKS FOREMAN. No. 4701.
REPRESENTATIVE (Coal). No. 4694.

Situations Wanted.

POSITION IN OFFICE OF CONSULTING ENGINEER (View to Partnership). No. 4695.
REPRESENTATIVE (STOVE). No. 4704.

Plant, &c., for Sale.

COMPLETE GAS-WORKS PLANT AND APPLIANCES (NEW STREET GAS-WORKS, EDINBURGH). Edinburgh and Leith Gas Commissioners.
STOCKPORT GAS-ENGINE. "G. H.," West End Advertising Agency.

Plant, &c., Wanted.

GAS-METER (20,000 feet). Leatherhead Gas Company.

Stocks and Shares.

PORTSMOUTH WATER COMPANY. Feb. 6.

Company Meetings.

BARNSTAPLE GAS COMPANY. Bridge Hall, Barnstaple. Feb. 16. Twelve o'clock.
GASLIGHT AND COKE COMPANY. Chief Office. Feb. 1. Twelve o'clock.
SOUTH METROPOLITAN GAS COMPANY. Cannon Street Hotel. Feb. 13. Two o'clock.

TENDERS FOR

Fire-Clay Goods.

BIRKENHEAD GAS DEPARTMENT. Tenders by Jan. 24.

Water-Gas Plant.

NELSON GAS DEPARTMENT. Tenders by Feb. 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

Subscribers who desire to avail themselves of the reduction in the Subscription by paying in advance for the Year 1907, are reminded that this can only be done during the current month.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND Co., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
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ANTIMONY OXIDE MANUFACTURERS—
FOR COATING GASHOLDERS, &c.;
ALSO BUYERS OF RETORT CARBON, ANY QUANTITY.

WALSAM DAVEY AND CO.,
REGENT HOUSE, REGENT STREET,
LONDON, W.

GAS OILS.

MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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PAINT FOR GAS-WORKS

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5, CROOKED LANE, LONDON, E.C.

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SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
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with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND Co.,
Ouse Chemical Works, SELBY.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

GAS TAR wanted. Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

INCREASE YOUR MAKE.

SEND for Particulars of the "RAPID" Carburettor. Why be short of Gas when you can stretch the make from 1000 to 2000 cubic feet per ton, without any difficulty?
Biggs, Wall, & Co., 13, Cross Street, Finsbury Pavement, London.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

"NUGEPE" GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
LOWER MOSS LANE,
MANCHESTER, S.W.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

BROTHERTON & CO., LIMITED. Offices: Commercial Buildings, Leeds. Correspondence invited.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

SIMMANCE-ABADY RECORDING Thermometers, Recording Pressure Gauges, and CO_2 Recorders, &c.

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HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

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ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, Bishopsgate Street Without,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim Street Chambers, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

BRISTOL RECORDING GAUGES AND THERMOMETERS.

J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 7, Park Square, Leeds.

AMMONIACAL Liquor wanted. Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

STOVE SEASON, 1907.

GENTLEMAN with First-Class connection desires a change.
Address No. 4704, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

POSITION, with view to Partnership, desired in the Office of a Consulting Gas and Water Engineer.
Address No. 4695, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Coal Representative for Yorkshire and Lancashire who has been successful in his sales to Gas Companies in these districts.
Apply, by letter, to No. 4694, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

MANAGER wanted for Small Gas-Works in County Durham. Twenty-eight retorts. Public Lighting.
Apply, by letter, with References to No. 4702, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a good leading Draughtsman, accustomed to Constructional Ironwork and Gas Plant, for Works in the North of England.
Full Particulars of Experience, stating Salary required, to be forwarded to No. 4703, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WORKS FOREMAN.

WANTED, for abroad, for large Gas-Works, a First-Class WORKS FOREMAN. Must be a good Carbonizer, thoroughly understand the working of Inclined Retorts and Carburetted Water-Gas Plant, capable of Organizing and Controlling Labour, and be systematic in routine. Must have held a similar position.
Apply, by letter, stating Age and Experience, together with *copies* of Testimonials, to No. 4701, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

NANTWICH URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS ACCOUNTANT AND COLLECTOR.

THE Council invite Applications for the above Position.
Salary £135 per Annum, rising £10 each Two Years to a maximum of £165.
Applicants must be between the ages of 25 and 40.
Applications, endorsed "Gas Accountant," stating Age, previous Occupation and Experience, and when at liberty, with *copies* of Three recent Testimonials, to be sent to the undersigned (from whom Particulars of the duties may be obtained) not later than the 31st day of January, 1907.
Canvassing will disqualify.

By order,
A. E. Whittingham,
Clerk to the Council.

7, Mill Street, Nantwich.
Jan. 13, 1907.

WANTED, a Second-hand Gas-Meter for about 20,000 cubic feet per hour. Must be in good condition.
Send Particulars and Price to the Secretary, Leatherhead Gas Company.

PURIFIERS wanted, 10 feet, 12 feet, and 15 feet square Boxes. Gasholders up to 100,000 cubic feet capacity. Every description of Plant bought and dismantled. Scrap Buyers of old Meters, Brass, Copper, and other metals for Cash.
State Particulars and Quantities to Firth Blakeley and Co., Gas Plant Buyers, Dewsbury.

FOR SALE, CHEAP—A Quantity of good Donkin's 12-inch GAS-VALVES; also a very good 3 B.H.P. GAS-ENGINE (Stockport).
Apply, S. While and Son, 60, Queen Victoria Street, London, E,C.

FOR SALE—50-H.P. Stockport Gas-ENGINE, Single Cylinder type, fitted with two 7-feet Fly Wheels and outside bearings on each end of crank shaft. Complete with Gas Bag, Silencer, Meter, Exhaust Piping, &c.
Apply to "G. S.," care of West End Advertising Agency, 195, Oxford Street, W.

BOROUGH OF NELSON.

CARBURETTED WATER-GAS PLANT.

THE Gas Committee invite Tenders for the supply and erection of a CARBURETTED WATER-GAS PLANT at their Brierfield Works.
Specification and full Particulars may be obtained on application to Mr. A. J. Hope, Engineer and Manager, Gas Offices, Nelson.
Tenders, endorsed "Gas Plant," to be sent to the undersigned not later than Monday, Feb. 4, 1907.
The Committee do not bind themselves to accept the lowest or any Tender.

J. H. Baldwick,
Town Clerk.

Town Hall, Nelson,
Jan. 18, 1907.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for RETORTS, BLOCKS, FIRE-BRICKS, FIRE-CLAY, &c., required at the Gas-Works during the current Twelve Months.
Forms of Tender may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Retorts, &c.," to be sent in to me not later than Five o'clock in the afternoon of Thursday, the 24th of January, 1907.
The person whose Tender may be accepted will be required to enter into a contract containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
Alfred Gill,
Town Clerk.

Town Hall, Birkenhead,
Jan. 17, 1907.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 1st day of February next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending on the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of office in compliance with the Company's Acts or Schemes of Amalgamation.

By order,
Henry Rayner,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., Jan. 14, 1907.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 13th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December last; to declare a Dividend for the same period; and to elect Two Directors and One Auditor in the place of those retiring by rotation.
The TRANSFER BOOKS WILL BE CLOSED from the 30th day of January inst. until after the Meeting.

By order,
Frank Bush,
Secretary.

Offices: 709, Old Kent Road,
London, S.E., Jan. 19, 1907.

BARNSTAPLE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Bridge Hall, Barnstaple, on Saturday, the 16th day of February, 1907, at Twelve o'clock noon, to receive the Report of the Directors and the Accounts for the Year ended the 31st day of December last, to declare Dividends, to elect a Director and an Auditor, and to transact the General Business of the Company.
The TRANSFER BOOKS WILL BE CLOSED from the 3rd to the 16th of February (both days inclusive).

By order of the Board,
F. L. Schofield,
Secretary.

Offices: 15, Cross Street, Barnstaple,
Jan. 17, 1907.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
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OF
OXIDE OF IRON AND LIME FOR PURPOSES of GAS PURIFICATION,
WITH NOTES ON THE
Determination of Sulphuretted Hydrogen and Carbon Dioxide in Gas Liquor.
Amended and Enlarged from Articles published in the "Journal of Gas Lighting."

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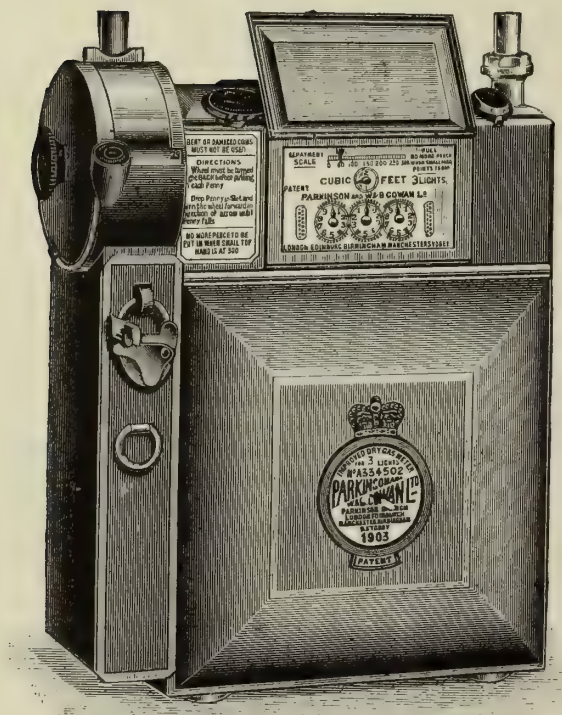
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VOL. XCVII., No. 2281.——TUESDAY, JANUARY 29, 1907.

EDITORIAL NOTES—GAS, &c.

Betterment at the Gaslight and Coke Company.

AFTER the somewhat gloomy successive financial statements that preceded 1906, the proprietors of the Gaslight and Coke Company received with marked satisfaction the greatly improved condition of affairs that the trading of the first half of last year enabled the Governor (Mr. Corbet Woodall) and his colleagues to present to them. This satisfaction will be further enlivened by the report and accounts that have been issued for the past half year. True, the better financial condition has been helped by kindly-disposed markets for coke and tar products, and by an increased consumption of gas; but those favourable aids alone are not sufficient to account for the healthier condition of the half-year's accounts when compared with those for the corresponding period of 1905. Administration can take credit for a considerable proportion of the balance of the improvement. A year ago, the proprietors heard from Mr. Woodall (who was at the time Acting Governor) of embryonic economies; in the revenue account before us, these economies have developed into substance. The final result is that, after setting aside £10,000 to the redemption fund, and transferring £2500 to the insurance fund, there is a balance of £353,940, as against £298,801 in the corresponding period of the preceding year, or a gain of £55,139. The amount brought forward was £210,481; so that the total sum available for distribution is £564,421, compared with £516,209. Paying the same dividend of £4 8s. per cent., the carry-forward will be £229,953, as against £181,298.

These are the whole figures that, as a rule, serve solely in the eyes of the lay proprietors as the index of prosperity and good management, or contrariwise. To stop at whole figures, however, does not enable any apportionment of credit, or otherwise, to be made as between fortuitous conditions, active enterprise, and economical management. The revenue account is worthy of study from these standpoints, for it distinctly discloses improvement as the effect of the operations of both external and internal energy. The fortuitous conditions (of course, supplemented by circumspect dealings) are reflected in the residuals accounts; the active enterprise, in the increased gas sales and connections; and the economical management, in the expenditure, without in the slightest sacrificing efficiency in plant or service. Examining first, in the usual order, the items on the receipts side of the account, the income from gas amounted to £1,512,275, or an increase of £8353. The percentage increase in the sale of gas was 1·1; but, in volume, the increase was 116,396,000 cubic feet—the total sale being 10,683,924,000 cubic feet. It must be remembered that the Company did an exceptionally good gas business in the first half of the year—the increase registered being equal to nearly 4 per cent.; so that the augmentation of the 1905 consumption in 1906 was equal to 2½ per cent. Given favourable conditions, there are excellent grounds for anticipating a continuation of this forward movement in business; for we hold that expansion in the numbers of consumers on the books of a gas company is a weightier element among the considerations affecting judgment as to the future than current percentage increases or decreases, which are subjected to so many disturbing factors of Nature's making. In the present report of the Directors, it is found that the number of consumers has been supplemented by 16,693, which, added to the number enrolled in the first half of the year, gives a further solid business backing of 30,105, compared with the position at the opening of the year. That is not all. There were 20,875 stoves coupled up during the half year, and 14,379 in the first half; so here again there are 35,254 new outlets for consumption. The rental-yield of stoves advanced by about £2000 compared with the corresponding period of last year; and the item is bound to present a further advance.

Turning to the residuals department, the prediction the Governor made six months ago, that coke sales during the half year would show an improvement, has been justified by the event; and tar and its products have also contributed to the increased income. But the figures in the revenue account do not, in their totals, present to view the whole of the higher value that coke and tar products have commanded. We must make comparison with the later statement as to residuals to see the full effect, for the greater returns have been obtained on a somewhat lessened sale, and presumably demand, in comparison with the latter half of 1905. Coke produced £218,187, which was an increase of £14,987; but the quantity of coke sold was less by 44,750 tons, and the quantity used on the works also showed a decline of about 6000 tons. Breeze, however, is short of the corresponding half-year's receipts by about £2000; and the quantity sold was 18,121 tons less. The income from tar and tar products was £48,487, or £8081 more. The quantity of tar used was 70,376 gallons less; but seeing that the total dealt with in a half year runs close up to 8 million gallons, variations of a few tens of thousands can hardly be wondered at. The receipts from ammoniacal liquor and sulphate amount to £80,026, which is a decline of rather more than £1000. In the quantitative statement as to residuals, it is seen that 6191 butts less liquor were used. However, the receipts from residuals amounted in the whole to £358,795, which was an improvement of close upon £20,000.

It is in connection with the expenditure side of the revenue account that there are exhibited material economies and advances in working excellence, without impairing in any way the efficiency of plant by any retrograde movement in upkeep. As a matter of fact, while something like £2000 less has been spent on the repair and maintenance of works, nearly £21,000 more has been expended in the distribution department on repairs, maintenance, and renewals. Therefore we must look elsewhere for the savings that have produced the reduction of £37,525 in the total expenditure, on comparison with the same period of 1905. The total disbursement for coal, oil, coke, and breeze used in manufacture, was £599,655, or £1391 more than in the corresponding half year. Examining the individual items, it is seen that only £5384 more was spent on coal; but, as will be shown, the tonnage used was less than in the period with which comparison is made. At the same time, it is gratifying that the item itself does not wear a worse aspect, remembering the views of coal owners in the early part of the year. Oil, on the other hand, exhibits a decrease of £7524; but coke and breeze has increased by £3530. Grouping these materials, the variation of only £1391 on the total cost is most satisfactory, considering the large addition of upwards of 116 million cubic feet to the gas sales; but it does not convey to the full the credit due to the working in the Company's chief technical department. The greater output of gas has been produced from a considerably smaller quantity of raw material. The quantity of coal used was reduced by 26,616 tons; the oil and spirit by nearly 858,064 gallons; and the coke by 6021 tons. It can therefore easily be seen what a substantial additional charge would have appeared in the revenue account if the yields of the materials used in the carbonizing department had remained at former levels. The technical staff are to be congratulated. There again the whole tale is not told; for this greater efficiency is accompanied by a reduction of £21,670 in manufacturing salaries and wages—the total for the half year being £119,870. Purification costs have also been reduced by £14,334; and on the year by nearly £26,000. The accounts are thus benefiting from the removal of the old statutory excesses in this connection. The effects of the quinquennial revision of the assessment of the Company's property which was completed twelve months ago (when some reductions were secured amounting to over £48,000) is seen in these accounts; for the £136,742 for rates and taxes in the half year is £12,082 less than for the corresponding

period. There are differences in other items of the revenue account, but they are of minor importance.

We have shown in this review of the accounts that the financial improvement revealed is due not only to increased business and better selling markets, but to retrenchment and reform—wisely and well ordered. Great things in this way cannot be accomplished in a day; but there are here substantial evidences of a prompt and successful attack.

Electrified Photometry.

Some information and much amusement have been afforded to gas men by the proceedings at the meeting of the Institution of Electrical Engineers on Thursday last. Mr. C. C. Paterson, an Associate Member of the Institution, essayed to give an account of tests which had been carried out at the National Physical Laboratory at Teddington with reference to "Light Standards and the Present Condition "of the High-Voltage Glow Lamp." The tests, in so far as they related to flame standards, had been undertaken two years ago at the instigation of the Institution of Gas Engineers, and the portion of Mr. Paterson's communication which deals with these standards is reproduced in another part of to-day's "Journal." The courtesy of the Institution of Gas Engineers, in permitting the results of these tests to be published for the first time by Mr. Paterson at a meeting of electricians, was duly acknowledged by him; but the contemptuous remarks on flame standards of some of those who rose to discuss the paper suggest that the courtesy was somewhat misdirected. Moreover, the evident bias of the author of the paper and his *confrères* towards things electrical, leads one to wonder whether the Institution of Gas Engineers had been well advised, in the first instance, in leaving this important investigation in the hands of an electrician. Bearing in mind, however, the limitations of his environment, Mr. Paterson has made a useful report, to portions of which we would more specially call the attention of readers of the "Journal."

Comparisons were made of the Harcourt 10-candle power, the Hefner, and the Carcel standards; and ratios were obtained in fair agreement with those realized at Charlottenburg and elsewhere. To most gas engineers, however, the subject of more immediate interest will be the influence of atmospheric conditions on the values of these flame standards, and of the Harcourt standard in particular. Mr. Paterson pointed out that the principal variations to which the air in a photometer-room is liable are changes of barometric pressure, and in the amounts of (1) carbon dioxide, (2) water vapour, and (3) oxygen and nitrogen. The grouping is noteworthy. The effect of changes in the amount of carbon dioxide was first studied. Normally, the carbon dioxide in the air at Bushy House—presumably in the photometer-room—only varied from 3 to 7 parts per 10,000, according to the somewhat cumbrous and not very precise mode of estimation employed. It is gratifying to know that no difference in candle power of the Harcourt standard could be detected within this range of variation. The amount of carbon dioxide was then artificially increased (by what means we are not informed) to 19 parts per 10,000, the photometer-room being closed, and candle-power readings were taken over four hours. Now, it is obvious that the lamp and the observer or observers—for Mr. Paterson seems to prefer to cumber his photometer-room with an assistant—were producing carbon dioxide and water vapour, and also consuming oxygen, during this period of four hours; and no account appears to have been taken of the diminution of oxygen, while it is not clear whether the artificial increase in the amount of carbon dioxide was not produced solely by the lamp and the observers. Those familiar with the effect of variations in the composition of the atmosphere on flames in general, know well that diminution of oxygen is at least as potent a factor as increase of carbon dioxide; and as Mr. Paterson set about studying the effect of the latter without excluding the former change, his results in this portion of his investigation seem worse than useless. They may refer to the combined effect of increase of carbon dioxide and diminution of oxygen corresponding with the consumption of pentane and the breathing of two persons; but we are not told that this is the case. Until more precise information is forthcoming, therefore, this part of Mr. Paterson's research may be dismissed from notice. It may, however, be permissible to conclude from this and earlier work that, given a properly ventilated photometer-room—*i.e.*, one in which the carbon dioxide will not exceed 8 parts in 10,000—the candle power of the Harcourt lamp will not be affected by slight variations in the composition of the air which are consistent with that criterion of the efficiency of the ventilation.

In regard to the effect of water vapour and of changes in barometric height on the light of the Harcourt standard, Mr. Paterson's present communication adds but little to the summary of researches on these points which was published in the "Journal" for Oct. 2 last (p. 20). With regard to variation in the amount of oxygen, Mr. Paterson hopes to make researches in the future; but his projected scheme of work does not promise more trustworthy results in this direction than those already referred to, which purport to show the effect of increase in the amount of carbon dioxide. As a fact, such investigations should be made in a chemical rather than a physical laboratory, for the mere photometric observations are simple routine work, whereas the determination of the composition of the atmosphere to the degree of accuracy necessary for the attainment of useful results calls for special analytical skill and knowledge.

We propose next week to offer some comments on Mr. Paterson's methods of photometry, and his work on the standardization of electric lamps. For the present, it will suffice to say that his communication presented a record of an immense amount of work, carried out often under unfavourable conditions, and that he is certainly to be heartily congratulated on his diligence and application.

Power Cost and Concomitant Considerations.

The "Engineering Magazine" has commenced a short series of articles, dealing with the choice of power for the workshop, by Mr. R. E. Mathot, whose name is intimately associated with modern work on the gas-engine, and with the literature of the subject. The first of the articles suggests points for consideration, which may be useful at the present time when there appears to be a lull in local and general discussion as to paying and competing prices of gas for power purposes. There has been quite a respectable amount of information published lately on the question of fuel costs for motive power. "Total costs" have also been published; but, from the whole figures (without having the details), it is a matter of exceeding difficulty to learn whether all the general factors contributing to a manufacturer's expenses for power have been conscientiously brought into account. Besides this, there are also factors which have a bearing peculiar to every situation where power is required. Among the rivals, the leading position in regard to heat efficiency, high authorities agree, is held by the gas-engine; but, nevertheless, the gas-engine will not abolish all other forms of power. M. Witz and Mr. Dugald Clerk have both issued warnings against one's enthusiasm being allowed to blind common sense in this matter. The rivals, as M. Witz has pointed out, have their individual advantages and disadvantages; and they will severally continue to find clients. But the gas-engine starts with some advantage as to heat efficiency; and the gas-engine driven by town gas has other advantages which must not be disregarded in the attempt to wrest business from the steam-engine and electricity, to check the progress of suction-gas plant, and to obtain the business that the extensions of manufacturing industries demand. As a rule, those advantages are not taken into account in published "total costs."

Before considering certain of them here, it may be submitted that there is abundant reason for keeping a tight grip upon what is proceeding in this particular line of competition. That there is a great deal of new business to be done is palpable by the marked attention that is being devoted all round to industrial requirements for the lower and medium powers. For the exceptionally large power gas-engines that are to be seen on the Continent, the scope in this country is somewhat limited; and it is not with engines of such colossal type that the gas industry can hope to have direct dealings. It is in the lower and medium power engines that the gas industry has a very deep concern; seeing that Mr. Dugald Clerk is of opinion that already from 15 to 20 per cent. of the gas produced in Great Britain is used for motive power. If due consideration is given to price, and there is proper appreciation of both the strong and the weak points of the competitors, there is no reason why there should not be a large increase in the volume of this business. For notwithstanding the competition of the oldest established of the rivals, steam, and the newer one, electricity, the same eminent authority in the gas-engine

world was saying towards the close of last year that, "at "the present moment, the output of engines exceeds any- "thing before experienced in Great Britain." This is a satisfaction; and it should also be an incentive to seeing that the increased business that is being done in the production and sale of gas-engines has an effect upon the day consumption of gas-works. If it has not any effect, then there must be inquiry as to the direction in which the business is going, and why. The greater number of these engines that are now being turned out are of the lower and medium powers, such as are suitable for manufacturers' workshops. It is with the power requirements of workshops that Mr. Mathot is dealing in his articles; and it is Mr. Dugald Clerk's belief, ripened by long experience and investigation, that the field for the coal-gas engine has its limit at 150-horse power.

That stakes out the power field of the coal-gas industry; and it is in this field that competition is being waged the fiercest between town's gas and suction gas for proportions of the business produced by this larger output of engines as to which authoritative statement has been made. Where suction-gas plants show up favourably is where the price of town's gas is high; but where they cannot compete on level ground is where a gas of respectable thermal value—say, about 600 B.Th.U.—is sold at a low price. In such places, the conditions ought not to require much consideration to persuade an intelligent manufacturer which of the two—the suction-gas plant or the town's gas supply—is the more conducive to his interests. And where the price of town's gas is above the competing level, even then the manufacturer should, before casting his decision, look very intently to the surroundings of the question, and not fix his whole mind upon the central point as to the cost of fuel per B.H.P. that is so persistently and so persuasively urged upon him. In his article, Mr. Mathot submits eight points that the manufacturer should consider. The first is the total power that the manufacturer requires; and we would add to this the question of whether that power is used intermittently or continuously. The second question for consideration is the space needed for the installation. There can be no debating that a gas-engine free from the suction-gas plant appendage requires the least space. The third question is the consumption of combustible, of water, and of oil. Again, there can be no doubt as to the superior working conditions with engines operating on a clean gas of some 600 B.Th.U., compared with the lean variable quality gas drawn by the engine working on a suction-gas plant. The fourth question for the manufacturer's consideration is as to the disposal of waste. There is no waste to dispose of where town's gas is used. The fifth question has a fine comprehensiveness. It embraces local conditions, restrictions imposed by the neighbourhood, legal regulations, requirements, &c. Being without the encumbrance of a suction-gas plant, it follows that in all these respects the engine driven by town's gas has an advantage.

Passing on, Mr. Mathot's sixth question has reference to first cost, interest, and sinking fund. In an article published in the "JOURNAL" on Jan. 8 (p. 86), it was shown that the average price of the winning suction-gas plants and engines in the Derby trials was £11 16s. per declared brake horse power; while the average of the same makers' plants in the Glasgow trials worked out to £9 15s. (of which £4 was the price of the producer) per declared horse power. This looks as though the improvements that have had to be made in the suction plants have rendered it necessary to charge higher prices for them. However, the proportion of cost that the gas plant bears to the engine has an important effect upon the question of initial cost, maintenance, and sinking fund. Question seven is as to the cost of maintenance and upkeep. Seeing that with town gas there are, in addition to the engine, only the coupling-up connections to keep in order, and to put in comparison with the perennial wear and tear that is going on in the suction-gas plant (which does not long continue in its pristine condition), this question of maintenance and upkeep does not admit of much discussion to ascertain whether a gas-engine alone or one *plus* a suction gas plant has the greatest expanding effect on the item. In this connection, it is entertaining to notice that suction-gas people are beginning to openly pull their rivals' plants to pieces. This they have long been doing privately, but not publicly. In the advertisements of one firm, the very pertinent question is asked, "Why does your suction- "gas plant only give half satisfaction?" In the answer to it, it is stated that "if the gas produced were of regular "quality, if clinkers could be avoided or removed without "opening the fire-door, if the fire-bricks could last for five "years, and if the valves of the engines had to be cleaned "only once a month, then your plants would be perfect." That statement may be left to take care of itself. The eighth, and last, question is reliability, regularity, and elasticity of operation. With these essentials in manufacturing operations, the suction-gas plant (without any means of storage upon which to fall back) cannot possibly comply with the delightful freedom of the town gas, with its constancy in supply, practically uniform calorific power, and perpetual availability—without any of the trouble and labour involved by the letting down, cleaning, charging, and banking-up required by suction-gas plant.

The questions alluded to in the foregoing are discussed by Mr. Mathot mainly in relation to the competition of steam plants with the gas-engine; but they come in equally handily in connection with the competition between suction-gas plant and ordinary gas. They are all considerations that may beneficially be laid before the manufacturer inquiring into the questions of the relative advantages of gas-engines run on town's gas and with suction-gas plants; for low cost of output, to quote from the article, "is not the "sole consideration." But it always remains the topmost factor in decision; and therefore the price of gas must needs have the foremost place in the shaping by gas manufacturers of their course of action in the competition. At the Southampton meeting of the Gas Institute a few years ago, Mr. Dugald Clerk put 1s. as the objective of the gas industry in regard to price for power business in competition with other systems; now he puts it at between 1s. and 1s. 6d. Cheap gas, aided by unfulfilled claims for suction-gas plants, has put a check upon the competition; but, by the help of claims based on such refinement of operation and cheap fuel as were disclosed in the Glasgow trials, the suction-gas plant will still make way. The most effectual means of checking the competition—a low-priced supply—must therefore be continued; but the concomitant factors should be kept equally prominent before manufacturers. Valuable aid can be gathered from Mr. Dugald Clerk's lecture at Sheffield, which we printed on Nov. 13 last, from the Derby suction-gas trials referred to in our issue of Dec. 25, and in the comparison of the Glasgow and Derby trial results published on the 8th inst.

Another Insolent Prospectus.

The impudence of the newest cliques of Gas Company promoters has no bounds. The exposure of their doings does not produce any modification of their designs. The latest scheme is for the development of the gas supply of a truly rural district of which Markyate is the centre; and Markyate, according to a report accompanying the prospectus, is four miles from any town known to the generality of people. One of these towns is Luton; and therefore—being some four miles from Luton—the promoters consider that to the public this sufficiently entitles them to offer the Markyate Gas-Works, with the proposed extensions through green lanes to groups of houses rejoicing in the dignity of being called, in this prospectus and report, variously "parishes," "districts," and "villages," under the pretentious designation, of the "South Luton District Gaslight and Coke Company, Limited." These new Gas Company promoters appreciate the attraction value of a name, even though what is behind the name is incorrectly represented by it. All the old tricks of the guarantee of a year's dividend, of calling attention to the remunerative character of incomparable gas undertakings, and of quoting the success of the slot meter and gas cooking-stove in London, are resorted to in this latest invitation to gas investors to sink their money in a proposal about which, craftily, no information is given but what is designedly indefinite and wholly non-committal. There is an imaginative estimate (based on the present price of gas of 5s. 10d.!) which, like the tale in the penny novelette, comes out right in the end. The promoters are asking the public for £30,000 capital, of which, if the public are silly enough to part with their money, £23,350 will be placed at the disposal of the Gas-Works Extension Corporation, Limited, who are the vendors, and who, in their benevolence, have charged no specific sum for goodwill, but who are going (as part of their agreement) to erect an additional "gasometer," retorts, with requisite buildings, &c. Of the £23,350, 20 per cent. is to be paid in cash, and the balance

in cash, or by allotment of fully-paid preference or ordinary shares, at the vendors' option. They also guarantee the first year's dividend, and pay expenses incurred up to the date of allotment. There is another concern mentioned in the prospectus that has a familiar appearance about it—"The Gas and Water-Works Supplies and Construction Company, Limited." But the Gas-Works Extension Corporation, Limited, is a new recruit to these promoting expeditions; for its registration was only announced in the "JOURNAL" for Dec. 11 last, when it was mentioned that the specified capital was £5000, in £1 shares. The ambitions of the "Corporation" are quite in harmony with its title. Our opinion is that the prospects of this concern (considering the notions of the promoters as to capital, and the price to be paid for the works, &c.) are very well illustrated by the crude skeleton map accompanying the prospectus. A letter that has come into our hands, signed by A. Harlow, shows that the Water and Gas Securities Exchange, Limited, are busy trying to place some 5½ per cent. preference shares "in a new gas undertaking, which has recently taken over a number of old-established gas companies, which have paid dividends for many years"—under their old capitals and management. The Exchange must be finding business rather difficult to effect just now, as the letter states that the "interest is guaranteed for three years by the Exchange."

Capitalism v. Municipal Ownership.

Among the matters that have been engaging attention at the seventh annual conference of the Labour Party, perhaps none is of so great importance as that which was introduced at Friday's session by Mr. W. Atkinson, who moved the following amendment to the constitution: "(1) This conference hereby declares its ultimate object shall be the obtaining for the workers of the full results of their labour by the overthrow of the present competitive system of capitalism, and the institution of a system of public ownership and control of the means of life." It might have been imagined that such a proposal would meet with, at any rate, a very considerable amount of favour at the hands of the conference; but in the result it was defeated by an overwhelming majority—the voting being nearly ten to one against it. In fact, the move was a dismal failure; and, so far as it goes, there is some cause for satisfaction in this. Mr. Pete Curran and Mr. Keir Hardie both spoke against the proposal; but this was doubtless not because they disagreed with it in principle, but because they realized that it was not in accordance with the views of the majority of those represented at the conference. Even, therefore, admitting that some of those who voted against the proposition were influenced by considerations other than the rights or wrongs of the suggested declaration against "the present competitive system of capitalism," it does not seem unreasonable to conclude from their action that Socialism is a very long way indeed from carrying all before it among the British working classes—just as it is in Germany, where the movement, as the elections now proceeding show, is losing ground rather than gaining it. Mr. Keir Hardie's admission was significant, when he said that the delegates who came to the conference represented the people behind them; and until the people behind them were Socialists, it would be a serious tactical error to attempt to enforce Socialism on them.

The Midland Junior Gas Engineering Association will meet next Saturday at the City of Birmingham Technical School, when a paper will be read by Mr. A. N. Comely, on "Refractory Materials Used in Retort-Settings."

Professor Silvanus Thompson on "The Manufacture of Light."—Our readers may remember that the lecture to working men at the last meeting of the British Association was delivered by Professor Silvanus Thompson, F.R.S., who took "Illuminants" as the subject of his discourse, which was listened to by an audience of about 2000 persons. It was noticed in the "JOURNAL" at the time; and it has now been published in a cheap and convenient form by Messrs. Macmillan and Co., Limited. Though the subject looks rather a tough one for working men, as presented in the booklet under notice, Professor Thompson brought it well within the comprehension of his audience; his lecture being made all the more intelligible by the experiments with which, by the co-operation of a number of firms and persons, he was able to illustrate it. The author has crowded into his 67 small pages of print a great deal of information, which is conveyed to the reader in language as free as possible from technicalities. The little book is well printed; but should a second edition be called for, it would be well to spell correctly, in the list of makers of photometers at the bottom of p. 14, the name of Dr. Letheby.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 296.)

THE Stock Exchange week just concluded was the reverse of cheerful. The opening was quiet, but the tone was tolerably good; some of the markets which are more liable to storm visitations being placated. The quietude continued the next day; but prices held on pretty well, aided by calmer conditions in the American Market. From this point forward to the end of the week, business became more and more restricted, and prices continued to droop as things grew deader and deader, until at last there was hardly any business doing at all. It seems as if the public mind was a prey to uncertainty, not to say apprehension—more especially in regard to prospective monetary conditions—and this being so, all enterprise is at a standstill. In the Money Market, after a little show of ease at the opening, a strong demand set in, and rates steadily increased in stiffness for short loans. For discount, the course was irregular and sometimes uncertain, but firm at the close. Business in the Gas Market made up a fairly good array of transactions in the aggregate; but it was to a large extent concentrated in the issues of the three big undertakings. The general tone was good throughout, and the market did not at all participate in the depression which weighed upon most other departments; for though changes in quotation were not numerous, they were fairly substantial advances. In Gaslight and Coke issues, the favourable effect produced in the preceding week by the dividend announcement was enhanced and intensified by the publication of the Company's accounts. There were considerable dealings in the ordinary stock at good steady figures, which all lay within the range of 100½ and 101½. The secured issues came in for more attention; and again the maximum advanced a point, with dealings at 90¾ and 91¼. The preference changed hands at from 107½ to 109½; and the debenture, at from 85 free to 86. South Metropolitan well maintained its activity, and prices were good and steady—marking 128½ free to 129¾. The debenture was done once at 85. There was little done in Commercials—one free bargain in the 4 per cent. at 111, and one in the debenture at 84¼, being the sum total. The Suburban and Provincial group was even quieter than usual. Brighton original was done at 234¾, British at 42½ (a rise of ½ in the quotation), and West Ham preference at 122. Without any business done, Southampton advanced 2, and West Ham ordinary 1½. On the Provincial exchanges, South Shields improved 2; but Liverpool "A" receded 1. In the Continental Companies, the feature was a rise of 3½ in Imperial, which changed hands at from 180 to 183. Union marked 127; and European fully-paid, 25. Among the undertakings of the remoter world, Buenos Ayres was done at 11⅝ and 11⅞, Primitiva ordinary at from 7 15/16 to 8 1/16, ditto preference at 5⅜ and 5 3/16, River Plate at from 12½ to 12⅝, ditto debenture at 97, San Paulo at 13¼, Cape Town at 14½, ditto debenture stock at 97¼, and South African at 15⅝ and 15¾.

The closing prices are shown in our list on p. 296.

ELECTRIC LIGHTING MEMORANDA.

Metallic Filament Lamps—The Rated and Actual Duties of Carbon Filament Lamps—Laboratory and Consumers' Conditions—Precarious Position of the Electrical Manufacturing Industry.

OPINIONS vary; and, of course, they varied largely in the discussion of Mr. James Swinburne's paper on the new incandescent lamps, which paper was noticed in the "Memoranda" last week. Some of the speakers were more hopeful than others of the metallic filaments. But where there is greatest hope, there the most favourable conditions for the new lamps are found. For instance, Mr. H. D. Munro has a 100-volt pressure at Exeter; and he has been using the Osmium lamps for the last three months, both for street lighting and for private purposes, and has now something like 2000 fixed. Osmium lamps are for low pressures; and there Exeter possesses an advantage in connection with the metallic filaments of which comparatively few other towns in this country can boast, and perhaps they do not want to. However that may be, Mr. Munro does not appear to have spoken very definitely about the candle power he is getting from these lamps. In one place, it is true, he refers to "50-candle power lamps." In another place, he says the lamps give a good average illumination—better than any low candle power lamp he has seen. Again he remarks that a great number of these lamps had an average life of 800 to 1200 hours; and, at the time, the effective candle power was within 10 or 15 per cent. of the candle power at which they started. At what actual candle power and wattage did they start; and at what actual candle power and wattage did they end their days? In his short speech, the whole tale, we fear, was not told by Mr. Munro; and there is probably something more that is to be learnt about his experience. So far as he went with it, he appears to have been especially favoured. Mr. Swinburne, in his paper, spoke of 75-volt 40-candle Osmium lamps and 100 to 130 volt 32-candle lamps. He also told of the exceedingly difficult matter it had been to make them. "Apart," he stated, "from the metal being very hard and infusible, it oxidized in the air if very fine, though this oxidation does not take place if the fine powder has been heated to

a high temperature. The peroxide of osmium formed is very poisonous. It gives off enough vapour at ordinary temperatures to cause much trouble, and especially to injure the eyes very seriously." Many figures were put forward in the course of the discussion which merely went to show that while these new lamps give higher efficiencies, the initial candle power is also higher, and thus the total watts used per hour per lamp work out in most cases at about the same magnitude as in the case of 16-candle carbon filament lamps—at the start, in both cases. It is the low candle-power lamp, with an efficiency of about 1 watt per candle, and which will work on a 200 to 220 volt system, that is the desideratum. But such lamps have not yet been discovered, and therefore the majority of electricians predict long life yet for the carbon filament lamp.

The discussion of high efficiency incandescent electric lamps has naturally emphasized the shortcomings of the low-efficiency lamps. So writes Professor L. B. Spinney in our American contemporary the "Electrical World." And it may be added that electricians evince praiseworthy candour—though knowing that the new high-efficiency incandescent lamps are, to the best of present knowledge, beyond their reach for high-voltage supplies—in making public the laxity in duty of their wares. The reason for their open attitude in this matter is that there is so much grumbling on the part of consumers as to the poor illumination obtained in comparison with the expense, that it is necessary for electricians to advise, and to give reasons for so advising, the utmost care in the selection of lamps by consumers. No reliance can be placed by the users upon the rectitude of the markings on the lamps purchased; and Professor Spinney can only suggest the desirability of proving for oneself the quality of lamps. That is precisely what the user does at the present time; and he pays dearly for the experience. It is only when he has parted with his money, that he can obtain evidence as to whether or not his lamps are up to their professed standard of virtue. There is not the slightest use unfortunately, so experience informs us, in allowing confidence to rest on the performance of a single lamp of one type; for the disparity in the deeds of carbon filament lamps of the same family is often considerable. Professor Spinney writes in the interests of electric lamp users; and he quotes the average results of a large number of tests that have been made at the Iowa State College, also in the interests of lamp users. Something over 1000 lamps were photometrically and otherwise examined; and in one table there are set out the results of the tests on 546 so-called 16-candle power lamps. The figures present the average initial mean horizontal candle power and wattage of the lamps; and they show how little confidence is to be placed on the ratings of the lamps, even in the initial stage, before deterioration commences. It will be remembered that the figures are average ones; so that they do not show how great were the flights of individual ones from specified duty. There were 119 16-candle lamps with a rated consumption of 3·1 watts per candle power per hour that gave 16·28 candles, with an average consumption of 3·11 watts per mean horizontal candle power; 378 lamps, with a rated consumption of 3·5 watts per candle power, that took 3·56 watts, and returned 15·8 candles; and eleven that did remarkably well, with a rated consumption of 3·6 watts per candle, in returning 17·5 candles for 3·55 watts per candle. The remainder were very bad. Of them 23 lamps, whose rated consumption was 3·8 watts per candle power, only returned 15 candles, consuming 4·15 watts per candle; and 15, rated at 4 watts per candle, gave 15·12 candles, on a consumption of 4·26 watts per candle. Those were new lamps; and to what condition they would arrive before consumers would discard them, is the part of their history to which Professor Spinney does not direct attention.

For reasons set forth in the preceding paragraph, there can be but little value to consumers in tests of sample carbon filament lamps conducted under laboratory conditions, except for the purpose of emphasizing their deficiencies. Even under laboratory conditions, there would have to be a wholesale rejection of such lamps—something like 40 per cent., Mr. Clifford C. Paterson, of the National Physical Laboratory, has told us—that refuse to be squeezed within the wide limits of the standard laid down by the Engineering Standards Committee (referred to last week). Further proof of this is furnished by the tests of representative lamps dealt with in the books recently issued by Mr. Lancelot W. Wild, from the Westminster Testing Laboratory, one of which—that incorporating the results of tests with incandescent gas-burners and mantles—was criticized last week. It will be remembered that Mr. Wild's method of testing incandescent gas-burners and mantles was the crude one of running the incandescent gas-lamps for 500 hours under practically the conditions that would necessarily obtain with the carbon filament lamp, without giving the former the advantage of having restored to them the original illuminating power, by the means of regulation and cleaning that their construction and intelligent use supply. Naturally, the time groups of results, as the tests advanced, showed some wonderful recessions in candle power. The third of Mr. Wild's volumes includes the tests carried out on twelve different makes of carbon filament lamp; four lamps being tested of each make We need not go into the conditions of testing the lamps, as the resulting figures cannot be used. But it may be generally said that, under the conditions of testing by experts in the laboratory, the carbon filament lamps exhibit some very notable oscillations of candle power and consumption as between the readings of the same lamps at various periods and of lamps of the same type. There are some lamps that are better than others in this respect, and certain of them may be described as excellent in their uniform performance over the length of the photometrical trials. If in the laboratory, such discrepancy in performance is found as is here illustrated, consumers must (as we know they do) fare very badly indeed with indifferent lamps and variable voltages. The results in the volume dealing with the Nernst, Tantalum, and Osram lamps indicate the advance of these lamps in efficiency in respect of consumption, and in cases show a fair consistency with regard to illuminating values and consumption. The tests of the electric lamps in Mr. Wild's books are of more value than are those (for the reasons stated last week) referring to incandescent gas-lamps. Further information on the subject of the variable illuminating power and consumption of carbon filament lamps will be found in Mr. Paterson's paper reported elsewhere in this issue.

The electrical manufacturing industry are feeling most keenly the asperities of an accumulation of inimical conditions; and the only way out of the present troublous state appears to be by a considerable sacrifice. Who are to be the victims, is the difficult problem. No one, of course, wants to be; but it is inevitable there will have to be loss in many quarters before there can be any material gain. And it is those who have sunk money in these concerns who will have to recognize that the earning capacity of that money has been largely depreciated, and that a considerable part of it will have to be written off as having no further real existence. The "Electrical Review" describes the condition of the electrical manufacturing industry as a precarious one; and it is feared that worse remains behind. There has been only a moderate degree of prosperity; but the prices of machinery have now become distinctly unprofitable. The developments of the uses of electricity, particularly of traction, and the municipal patronage of electricity, some few years ago invited capital which swept into the plant industry with strange freedom. The result to-day is that the manufacturers, through over-competition at home, and successful pressure from abroad, are glad to keep their works going by accepting contracts at about cost. Even then they lose important contracts by under-cutting from Germany. Simultaneously, materials have become more costly; and to add to the miseries of the manufacturers, they find municipalities are hard masters and slow payers. Under such circumstances, the outlook is indeed gloomy, and the scanning of the horizon for signs of recuperation produces at the present time nothing that gives hope. The shareholders of the Westinghouse Company are heavy sufferers. When this gigantic Company started their huge works in Trafford Park, they were going to sweep everything before them, and were going to show how American ideas and methods were soon to take the lead. Let us see how this has worked out. The trading profit in the Company's last fiscal year amounted to £7630 on a share capital (not mentioning borrowed money) of £3,250,000; and the net result is a debit at profit and loss of £102,942. Nothing during the year has been written off the suspense account of £188,240; and no provision has been made for depreciation. The machinery is now becoming —some has become—obsolete; and the book value of patents and goodwill is distant from actual representation. The stock in hand and in course of manufacture is also admittedly overvalued. Economies have been brought about in the last year or two; but the foregoing is an outline of the general condition of things in connection with this huge concern. There has been over-sanguineness, mixed with mismanagement and extravagance. Result: Resolutions have lately been passed to reduce the share capital of £3,250,000 to £1,875,000, and to alter, in the Articles of Association, the nominal rates of dividend from 6 per cent. to 10 per cent. on the preference shares and 12 per cent. on the ordinary.

Early Days of Gas Lighting in London.

Yesterday was a red-letter day in the history of gas lighting in London; for exactly a hundred years ago Pall Mall was successfully lighted by Mr. Winsor with the new illuminant which he had brought under the notice of the public by his lectures at the Lyceum Theatre. A few evenings before the event, as recorded in "The Times" for Jan. 21, 1807, a select party of the nobility, among whom were Lord Minto, with his lady and friends, Lord H. Petty, and others, inspected the installation, and "seemed much gratified by the gas-flame serving for lights and culinary purposes." Among various experiments, we are told, "the boiling a kettle, and smelting ore, at the same instant, on a paper tube—burning lights under a glass globe—producing a lighthouse which no wind or water could extinguish, excited admiration." It appears that a noble party afterwards viewed the illuminations in the committee-room, saloon, and dining and drawing rooms. The last two, though not entirely finished, "showed the beautiful effects of lights by two flying Cupids and a Grecian lamp." The writer of the account added: "When the celestial hemispheres of the ceiling (corresponding with the terrestrial hemispheres of the carpet) shall be finished, the *tout ensemble*, we presume, will have a novel and classic elegance. The saloon, we hear, is to show the solar system. The noble company seemed so much entertained, that they stayed from nine till after eleven o'clock." They, as well as others, were evidently impressed with the value of the new illuminant, for Mr. Winsor projected in the course of the year a company for the manufacture of gas, and succeeded in raising a capital of £20,000.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report.

The following is the report on the working of this Company during the six months ending Dec. 31, which, with the accounts (see p. 293), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £10,000 for the half year towards the redemption fund (in accordance with the provisions of the Company's Act of 1903), and carrying £2500 to the insurance fund, there remains a balance of £353,940. The amount brought forward from the previous half year being £210,481, there is a total sum available for distribution of £564,421, out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 8s. per cent. per annum, which will absorb £334,468, and leave the sum of £229,953 to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of 1·1 per cent. over those of the corresponding half of 1905; the increase for the year 1906 over 1905 being 2½ per cent. There has been an addition during the half year of 16,693 consumers, and an increase of 20,875 in the number of gas-stoves sold and let on hire. The gratifying financial result of the half-year's working has been contributed to by increased sale of gas, better working, and the enhanced prices obtained for coke and tar products; also by a considerable reduction in the assessment of the Company's undertaking.

The London County Council are again promoting a Bill in Parliament to acquire powers with respect to the supply of electrical energy in the Administrative County of London and neighbouring areas, and for other purposes. This Bill, as in the case of the similar Bill rejected last session, will be closely watched, with the object of protecting the Company's interests as ratepayers. Certain other Bills will need careful watching; but, on the whole, so far as this Company is concerned, the forthcoming session promises to be a quiet one.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distribution Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

PERSONAL.

The Coventry Corporation Water Committee have received and accepted the resignations of Messrs. J. J. Derry and W. Baxter, Engineers at the Spon End and Whiteley Water-Works, respectively.

At a meeting held on Friday, the Directors of the Oswestry Gaslight and Coke Company, Limited, appointed Mr. E. Hamson to the position of Manager, in succession to Mr. J. H. Parsons, whose death was recorded in the "Journal" a few weeks ago. Mr. Hamson, who was selected from 178 applicants, is at the present time acting as Assistant to Mr. J. J. Jervis, the Manager of the Swindon Gas-Works.

Mr. A. E. Davey, who has recently been appointed Manager and Secretary of the Aberdare Gas Company, has been presented with a handsome marble clock, suitably inscribed, by the employees of the Cardiff Gas Company, whom he is leaving after thirteen years' service. The presentation was made by Mr. George Clarry, the Secretary, in the unavoidable absence of Mr. Henry Morley, the Engineer and Manager.

Mr. James Randall, who for nearly fifty years was Secretary of the Tottenham and Edmonton Gas Company, has retired, and has accepted a seat at the Board. Mr. E. Topley, the Assistant-Secretary, has now been appointed to Mr. Randall's old position. It may be remembered, from a short history of the Tottenham Gas-Works which appeared in the "Journal" for Oct. 2 last year, in connection with the visit of the Eastern Counties Association to Tottenham, that Mr. Randall's connection with the Company dates from 1851, and that he was appointed Secretary in 1857.

The position of Assistant Engineer and Manager of the Preston Gas Company, for which applications were invited in the "Journal" a few weeks ago, has been filled by the appointment of Mr. S. Tagg, Assistant to Mr. T. O. Paterson at Birkenhead. Mr. Tagg was trained under the late Mr. W. R. Chester, at Nottingham; and he was with Mr. R. O. Paterson at Cheltenham before going to Birkenhead. There were 120 applicants for the position, and they were reduced successively to 38 and 5. It was a very close run between two of the latter; but the Directors thought Mr. Tagg possessed qualities which specially suited him for discharging the duties to be entrusted to him.

The Scottish Junior Gas Association, Eastern District, will visit the Glenboig Union Fire-Clay Works next Saturday. It is the intention to travel from Edinburgh by a forenoon train, *via* Larbert.

The Rothamsted Experimental Station (Lawes Agricultural Trust) has received a donation of £2000 from the Permanent Nitrate Committee, to be invested and added to the general endowment fund of the station. A donation of 100 guineas has also been received from the Fertilizer Manufacturers' Association.

OBITUARY.

WILLIAM M'CRAE.

It is with more than the customary regret, because of the early period of life at which he has been cut off, and of the consequent untimely close of a career of promise, that we record the death of Mr. William M'Crae, the Engineer and Manager of the Corporation Gas Department at Falkirk, which occurred at his residence in Falkirk on the morning of Tuesday last. Mr. M'Crae was only 43 years of age. He was born in Airdrie, where his father—Mr. Boyd M'Crae—was Gas Manager. When deceased was only two years of age, his father was appointed Manager at Dundee—shortly before the transfer to the Corporation. The son was thus brought up and educated in Dundee. He was trained to his life-work by his father; and under his elder brother—Mr. John M'Crae—who later succeeded their father in the management at Dundee, he became Assistant-Manager. On the sudden death of Mr. John M'Crae, in October, 1896, at the age of 44 years, Mr. William M'Crae was appointed his successor. That post he relinquished in June, 1902. In July of the following year, he was appointed Engineer and Manager at Falkirk. While he was in Dundee, he carried through large extensions and renewals of the works; and on his arrival in Falkirk, he was at once thrown into the midst of a controversy about a site for the erection of new works. These works he built at Thornhill; and when they were opened, in May of last year, it was universally recognized that a gas-works of the most up-to-date character had been provided. Unfortunately, before the opening day, Mr. M'Crae's health had broken down; and when the ceremony was performed, he was staying at Harrogate, for the benefit of his health. He returned to office; but recently his health again gave way. In the middle of December last, he sent in his resignation, which was accepted; but his successor has not yet been appointed. Since his resignation, he has been confined to the house, and latterly to bed. On Tuesday morning, between five and six o'clock, he sat up in bed, complaining of pain, and fell back dead. He is survived by a widow, but no family. In April last, Mr. M'Crae was President of the Informal Meeting of Scotch Gas Managers in Glasgow, when he acquitted himself with much acceptance; and in July he was elected a Vice-President of the North British Association of Gas Managers. The funeral took place on Friday at Falkirk Cemetery. It was attended by the Magistrates and Town Council, in their official capacity; and there were also present about twenty brother gas managers. The Gas Committee of the Corporation, on Tuesday evening, instructed the Town Clerk to forward a letter of condolence to Mrs. M'Crae, for whom much sympathy is felt.

Gasholder "Explosion" at Montagnana (Italy).

Confusing and conflicting accounts of a serious "explosion of a gasholder" have been given in some Italian newspapers to hand. Montagnana is a small town of about 3500 inhabitants, not far from Padua, in the province of Venetia. Its gas-works belong to the firm of Giuseppe Meneghetti and Co. Increasing demands for gas had led to an extension of the storage capacity of the works, and either a new gasholder, or a new lift to an old one (according to one report), was just being completed. Apparently it was while this was being tested on the 9th inst., that the explosion occurred, which unfortunately involved the loss of three lives, besides injury to others. The holder is said suddenly to have burst; and the crown is described to have been blown out just like a plug. The actual cause of the accident is stated in the Italian newspapers to be not accurately known; but it is variously attributed to a spark from a file, or to a match struck by one of the workmen, or to a lighted candle which, it is alleged, was being used to ascertain if the holder was retaining the gas that was being at the time put into it. As far as can be judged from the meagre information at present to hand, it would seem to be an explosion caused by igniting a mixture of air and gas in a holder undergoing repairs or extensions—proper precautions not having been taken for its ventilation. The explosion destroyed all the adjacent telegraph wires; and telegraphic communication with Montagnana was cut off. The town was plunged into darkness, and the inhabitants were terrified, as they at first thought that an earthquake was taking place.

Mr. J. M'Leod, of Glasgow, read a paper, entitled "The Redistribution of the Nitrogen in the Distillation of Coal," before the Scottish Section of the Society of Chemical Industry, in Glasgow, on the evening of Tuesday last. In the course of his paper, Mr. M'Leod said the factors governing the amount of ammonia and of nitrogen and of cyanogen produced were: (1) The size of the coal when introduced into the retort. If small, the heat took longer to penetrate the charge, and, consequently, the products differed. (2) The amount of extraneous moisture the coal contained. If the coal were wet when put into the retort, experience showed an increased amount of carbonic acid, sulphuretted hydrogen, tar, and ammonia. (3) The temperature of the distillation. High heats produced a marked increase in the amount of cyanogen, and also influenced the amount of nitrogen retained by the coke.

WATER BILLS FOR 1907.

THIRD ARTICLE.

THE Metropolitan Water Board (Charges, &c.) Bill provides for uniform scales of charges for water applicable throughout the Board's limits of supply. For the purposes of the proposed Act, section 72 of the Water-Works Clauses Act, 1847, is to be read as if the words "rateable value" had been inserted therein instead of "annual value," and "twenty pounds" instead of "ten pounds." Altered as indicated, the clause will stand as follows:—

The owners of all dwelling-houses or parts of dwelling-houses occupied as separate tenements, the *rateable* value of which houses or tenements shall not exceed the sum of *twenty* pounds, shall be liable to the payment of the rates instead of the occupiers thereof, and the powers and provisions herein or in the Special Act contained for the recovery of rates from occupiers shall be construed to apply to the owners of such houses and tenements; and the person receiving the rents of any such house or tenement as aforesaid from the occupier thereof, on his own account or as agent or receiver for any person interested therein, shall be deemed the owner of such house or tenement.

In order to make uniform throughout their limits the obligations of the Board with respect to the supply of water, section 35 of the Act of 1847, relating to a constant service, and certain sections of the Acts of the eight Companies whose undertakings the Board have acquired, are to be repealed, as well as existing enactments with respect to water-rates and other charges. Clause 9 of the Bill sets forth that the Board shall furnish, at the request of the owner or occupier of any house, or part of a house occupied as a separate tenement, a supply of water for domestic purposes at a rate not exceeding 5 per cent. of the rateable value of the house or part of a house in respect of which the supply is required. The rateable value is to be determined by the valuation list in force at the commencement of the quarter for which the rate accrues, or, in the absence of such list, by the last rate made for the relief of the poor. The Board may, on being requested so to do, supply water by measure on such terms as may be agreed upon; but the price to be charged (otherwise than for hydraulic power) is not to exceed 1s. per 1000 gallons. No extra charge is to be made in future for high service. By clause 20, the expression "domestic purposes" is defined as including water-closets and also baths so constructed or fitted as not to be capable of containing when filled more than 50 gallons; but it does not include a number of purposes which are clearly specified. Provision is made for the payment of water-rates by owners of small houses; and the Board seek power to compound rates. The charge for water for public purposes is to be at the rate of 6d. per 1000 gallons; and for supplies in bulk beyond the limits, on such terms as may be agreed upon. Water-rates are to be recoverable in the same manner as those made for the relief of the poor or by action. The provisions of sections 4 and 5 of the Water Companies (Regulation of Powers) Act, 1887, are to apply to the Board as if they were a trading company; the Metropolis Water Act, 1902, is to be amended in certain respects; and the Water-Rate Definition Act, 1885, is to be repealed. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Metropolitan Water Board (Various Powers) Bill is a comprehensive measure to authorize to Board to construct waterworks, acquire lands, and carry out other objects. The works comprise a tunnel under the Thames, commencing at Twickenham and terminating at Richmond, a large number of conduits or pipelines, a reservoir adjoining the present one belonging to the Board at Croydon, and a road in the parish of Wandsworth. The Board seek power to connect these works with those already existing, lay mains beyond the limits of supply, alter the position of their mains and pipes, and underpin houses where necessary. The period for the completion of the works specified is seven years from the passing of the Act; and an extension for a like period is asked in respect of a reservoir and a conduit or pipeline authorized by the Lambeth Water-Works Act, 1900. Powers granted by the Southwark and Vauxhall Water Act, 1898, for the construction and completion of a pumping-station at Walton-on-Thames, and a conduit or pipe-line in connection therewith, are to be revived and continued for a period of three years. The Bill contains a scheme for the establishment of a superannuation and provident fund. Among the numerous miscellaneous provisions are some authorizing the Board to deviate from the limits specified for the Lambeth reservoir; execute works on lands at Long Ditton, Enfield, and Westerham; make agreements with the Conservators of the Thames in regard to the abstraction of water from the river; establish communication with the works by means of electricity; and alter pipes, wires, &c., under streets. The Board seek power to borrow £330,000 for the purchase of land and the execution of the works to be authorized by the Act; £350,000 for those for which an extension of time is required; £100,000 for the Long Ditton, Enfield, and Westerham works; the amount necessary for defraying the expenses of the Act; and, with the sanction of the Local Government Board, such further sum as may be required. For the three amounts specified, sixty years are asked in which to repay them; for the costs of the Act, five years; and for the further amount, such period as the Local Government Board may determine. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bill promoted by the Ogmore and Garw Urban District Council is (*inter alia*) to authorize the Council to purchase the water-works of the local Gas and Water Company, and part of the water undertakings of the Dinas Main Colliery Company, Limited, and the Britannic Merthyr Coal Company, Limited, and Christmas Evans, and any or either of them, construct additional works, and supply water within their district. The Council are to give the Companies notice to treat for the purchase of their undertakings within a year after the passing of the Act; and until the transfer takes place, they will be carried on as at present. The Council seek power to maintain and continue the existing works, which are fully described in the Bill, and construct in addition a reservoir in the parishes of Llangeinor and Llandyfodwg, an aqueduct or pipe-line from it to another reservoir to be situated wholly in the last-named parish, and an aqueduct or pipe-line therefrom to the township of Gilfach Goch. These works are to be completed within ten years. The limits of supply are to be the whole of the Council's district in the county of Glamorgan, except the part of it included within the statutory limits of supply defined by the Garw Water Act, 1889, which is not at present served by the Company. The charges for water for domestic purposes are to be based on the rateable value of the premises. Supplies by meter are to be at a rate not exceeding 1s. 6d. per 1000 gallons; and those furnished in bulk, on such terms as may be agreed upon. The Council ask for authority to borrow for the acquisition of the existing water undertakings such sums as may be necessary; for the purchase of lands and the construction of additional works, £45,700; for extensions and improvements, £7000; and such further sum as may be sanctioned by the Local Government Board. Fifty years are required for the repayment of the purchase-money in respect of the present works, and sixty years for that borrowed for additional works and extensions. The Council will keep separate accounts of the water undertaking. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Penrith Urban District Council Bill is to authorize the Council, among other things, to construct additional water-works; and it will also enlarge their powers in respect of the supply of water. The new works comprise a dam for raising the level of Hayeswater, two tanks, with inlet and outlet works, and three aqueducts or pipe-lines; and they are to be completed within five years. Powers are sought to make bye-laws for the prevention of pollution of the water. The rates to be charged for water for domestic purposes are not to exceed 1s. 6d. in the pound on the rateable value of the premises supplied, according to the valuation list or the last poor-rate; and this is also to be the maximum price per 1000 gallons in the case of meter supplies. Provisions are made for the sale of water in bulk. Power is required to borrow £40,050 for the purchase of lands and the construction of works, £6650 for the extension and improvement of the water undertaking, and the amount necessary to defray the costs and expenses of the Act; the amounts to be repaid in sixty, fifty, and five years respectively from the date of borrowing. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

The Bill promoted by the St. Neots Urban District Council is to authorize them to acquire the undertaking of the St. Neots Water Company, and supply water throughout their district and the neighbourhood. Confirmation is sought for an agreement which has been entered into between the Liquidator of the Company and the Council for the sale of the undertaking for £9000; and upon the completion of the purchase, the Council will take up the supply. The Company will be wound up and the books handed over to the Council. Power is required to make additions to the existing works. The rates originally sanctioned for domestic supplies are to stand; and the Council purpose charging in addition a sum not exceeding 5s. per annum for every closet beyond the first, and a maximum of 7s. 6d. per annum for every fixed bath capable of containing not more than 50 gallons. They require authority to borrow the amount necessary for the completion of the purchase, £3000 for extensions, the money requisite for paying the costs of the Act, and any further sum that the Local Government Board may sanction. Fifty years are asked for the repayment of the two first-mentioned amounts, five years for the third, and such period, not exceeding sixty years, as may be prescribed for the fourth. Separate accounts are to be kept. [*Parliamentary Agents: Messrs. Warwick Webb and Co.*]

The Bill of the Sheffield Corporation is (*inter alia*) to confer further powers upon them with respect to their water undertaking. Authority is sought to construct two aqueducts or pipe-lines, both terminating in the existing Underbank reservoir, to be completed within seven years from the commencement of the Act; also to make agreements with millowners as to the compensation water to be discharged into the Rivers Rivelin and Loxley. The Corporation wish to be empowered to lower the charges for fixed baths or water-closets, or both, in dwelling-houses of a net annual rateable value of £50 or under, or even, if they see fit, to exempt the owners and occupiers entirely from payment. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Bill promoted by the Southport, Birkdale, and West Lancashire Water Board is to authorize them to purchase certain water-works from the Skelmersdale Urban District Council. An agreement has been entered into between the Council and the Board; and if this is confirmed by the passing of the Bill, the Scarth Hill undertaking of the Council will vest in the promoters, who seek power to maintain and improve it. The purchase-money is £22,500. The Board ask for authority to borrow this amount, and such sums as may be necessary for defraying the expenses incidental to the transfer, and purchasing from the West Lancashire Rural District Council certain pipes in Bickerstaffe; £1736

for connecting the Scarth Hill undertaking with their works; and £1000 for its extension and improvement—all to be repaid within a period of forty years. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Tees Valley Consolidation Bill is to consolidate, with amendments and additions, the Acts relating to the Tees Valley Water Board. The first portion of the Bill deals with the constitution of the Board, and defines the periods for which the members are to remain in office. The Board ask for authority to complete the construction of the Grassholm reservoir and of a certain conduit, notwithstanding the repeal of the Acts sanctioning these works. The Bill contains provisions preserving the rights of the Corporation to take water from rivers, and defining the quantity to be returned to them by way of compensation. Authority is sought for the sale of portions of the undertaking to the Council of any urban or rural district within the limits of supply, and beyond the boundaries of Stockton, Middlesbrough, and Thornaby-on-Tees; and also for the supply of water in bulk, under specified conditions. The charges for water for domestic use are to be based on the annual value of the premises supplied, with extras for closets and baths; but beyond the above-named boroughs they may be one-fourth more than the town charges. The Board are to be compelled to supply water for trade, manufacturing, and railway purposes, but without prejudice to a full domestic supply. The financial provisions of the Bill include power to the three Corporations constituting the Board to borrow the amounts named for the various purposes specified; and the periods for repayment are all defined. [*Parliamentary Agents: Messrs. Wyatt and Co.*]

The Tynemouth Corporation Bill is to extend the limits for the supply of water, and to enable the Local Authorities within the added area to require the Corporation to sell water to them in bulk. The extension will include a large number of districts, parishes, and places in the county of Northumberland; and they are to be supplied at a rate not exceeding 6d. per 1000 gallons and an annual sum sufficient to cover the interest on the money expended upon certain works to be constructed under the Act. These comprise four reservoirs and six pipe-lines. Borrowing powers are required to the extent of £100,000 for completing the works authorized by the Corporation Water Act of 1898, and of £2000 for making an approach road to the Font reservoir; also £62,500 for carrying out new works, £50,000 for paying interest on money borrowed, and such sum as may be necessary for defraying the costs of the Act. Sixty years are required for the repayment of all loans but the last, which has to be liquidated in five years. The money may be raised by the issue of Corporation redeemable stock. [*Parliamentary Agents: Messrs. Durnford and Co.*]

When noticing the Bills promoted by Companies (*ante*, p. 145), it should have been mentioned that the Newquay and District Water Company are applying for power to extend their limits of supply so that they shall be coterminous with those of the Newquay Urban District Council and the parishes of St. Columb Major, Colan, and St. Columb Minor Rural, all in the county of Cornwall. The existing works are fully described in the Bill, and authority is sought to construct others, consisting of two wells and pumping-stations, two headings, a covered reservoir, and eight pipe-lines, to be completed, as regards specified portions, within five years, and as to other portions within seven years, from the passing of the Act. The charges for water for domestic purposes are to be based upon the gross estimated rental of the premises supplied; with a minimum price of 8s. 8d., and a period of twelve months. Closets after the first and fixed baths are to be extras. The charge for supplies by meter is not to exceed 1s. 6d. per 1000 gallons. Authority is required to raise additional capital to an amount not exceeding £38,000, to carry 7 per cent. dividend if issued as ordinary, and 5 per cent. if as preference capital. Borrowing power to the extent of one-third is sought in respect of the new as well as of the existing capital; the latter to be inclusive of £5000 that is already raised. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The "Graetzin" Gas-Lamp in Vienna.—According to the "Neue Freie Presse," a trial of the above-named lamp, of which some particulars were given in the "JOURNAL" for the 8th inst., has lately taken place in Vienna, in the Herrengasse and on the Stephanie Bridge, in the presence of the officials; and it was attended with marked success.

Value of the Gas-Engine.—Last Tuesday evening, a meeting of the Manchester Section of the Institution of Electrical Engineers, presided over by Dr. Edward Hopkinson, was held in the Physical Laboratory at the Manchester University. A paper on "Gas-Power Plants" was read by Mr. C. E. Douglas, in which he advanced some arguments for the installation of gas-power plant, and gave a general description of typical plants and some actual results of operation. He said that the gas-engine was the only one which was available to give power at a lower cost of operation than the steam-engine; and he held it to be proved that for industrial purposes the gas-engine, with its supply plant, was at least sufficiently reliable to warrant a greatly extended sphere of operation, and that it could be worked with more economy than any other form of power plant. On the Continent of Europe, large gas-engines had been installed and were in daily use; and this form of motor, he submitted, merited far more attention and consideration from engineers in this country.

SOCIÉTÉ DES INGÉNIEURS CIVILS DE FRANCE

Presidential Address of M. Emile Cornuault.

(*Concluded from p.* 209.)

THE WELSBACH MANTLE.

In 1885, Dr. Auer von Welsbach (taking up the same idea that Frankenstein had) arrived at a nearly perfect solution of the problem of incandescent gas, after having made numerous laboratory experiments. In principle, the Auer burner consists of a mantle formed of a framework of infusible refractory metallic oxides, suitably chosen and arranged above a bunsen burner; a woven cotton mesh is soaked in a solution of the metallic oxides which have been adopted, and the material becomes incrusted with these bodies after the style of natural petrifications; then it is burned off, and remains only a skeleton of ash, formed by the incombustible oxides, which become incandescent under the action of gas combustion.

At first, the mantle formed by the oxides of zirconium and lanthanum gave a light of a livid greenish tint, which was certainly one of the causes of the unpopularity of the new process for some years. Besides this, the mantle was very fragile. Then its life was short, and its lighting power diminished rapidly with the duration of the mantle. It was almost under these conditions that the Auer burner was presented in 1889 to the Jury of the Lighting Section of the Exhibition. Here allow me to call to mind a personal reminiscence, for I remember the discussions that took place on this subject among the Jury, and the great trouble that we had to obtain a mere silver medal for this burner, upon which I experimented in the laboratory with M. Sainte-Claire Deville. Here is the exact wording of my official report: "The light of this burner is steady and agreeable to the eye; the heat given off is slight; when the mantle is new, the carcel can be obtained with 23 litres of gas; but the efficiency diminishes with the age of the mantle (a fact that we also find in the incandescent electric lamp), and the tests of M. Sainte-Claire Deville have shown that the lighting power of 2·92 carcels with a new mantle falls to 1·41 carcels at the end of about 250 hours. The burner has improved and probably will be improved still more. As it is, the Auer burner is of a kind to render real service. . . ." It was, as you see, a little in the way of encouragement; and the sequel showed that it had been well placed. Two years afterwards, a *grand prix* would hardly have been haggled over. But this quotation, the date of which, to be exact, is the end of 1889, clearly shows that if the future of the Auer burner had been foreseen in 1889, it was yet far from possessing those qualities which were going to enable it to transform lighting by gas.

It was only in 1892, after many experiments, that Dr. Auer, by modifying the original composition, formed his mantle of oxide of thorium and a small amount of oxide of cerium (about 99 per cent. thorium and 1 per cent. cerium). This was the "Auer mixture." The oxide of cerium used in small quantity had been found to increase in considerable proportion the emissive power of the oxide of thorium. This new composition and numerous improvements in detail, which were effected little by little, completely modified the situation. The mantles supplied after 1892 gave a brilliant, warm light, "*offrant de la surface*," as it is professionally termed, notably exceeding in intensity the light of ordinary incandescent electric lamps. Also, since 1893, it is by "hundreds of thousands" that the numbers of Auer burners put up in France are to be reckoned.

THEORIES OF INCANDESCENCE.

Long before Auer, gas engineers had had the idea that gas could be better employed by using it to bring a particular refractory body to incandescence, than by only employing its illuminating power obtained directly by combustion; and it was reasoned thus: The particles of free carbon, the irradiation or incandescence of which produce the light, are contained in a small part of the volume of gas, as they only arise from the decomposition of the hydrocarbons of the aromatic and ethylic series, which, as M. Sainte-Claire Deville has shown, only account for 4 to 6 per cent. of the total volume of the gas. The other parts of the total volume do not bring any aid to the illuminating power. Though having an important calorific value, they remain unutilized in burners not based on incandescence, and it is this lost energy which the latter burners are designed to utilize.

Whatever value this explanation may have, it has been held insufficient; and it is requisite to recognize that, apart from the combustion heat of the gas, in order to explain the lighting power of the Auer mantle, it is needful that there be produced besides another action increasing the intensity of the luminous rays emitted. Several theories have been advanced. That of Dr. Bunte attributes the great radiating power of the mantle to the high temperature which the oxides of rare earths attain in the flame, due to catalytic properties of oxide of cerium. The gas combustion produces, first of all, an elevation of temperature in the mantle, and, consequently, a radiation of light from the mass of the mantle; then, in the presence of the gas flame, the cerium, by its catalytic action, raises the combination of hydrogen and oxygen, and develops a very high temperature, by which it is brought to most active incandescence.

M. Emile Sainte-Claire Deville, to whom we owe so much for scientific work concerning the chemistry of gas, also attributes

the intensity of the light produced by the Auer mantle—composed, as stated above, of about 99 per cent. of thorium and 1 per cent. of cerium—to the presence of cerium, a body the spectrum of which is much richer in luminous radiations than that of thorina (oxide of thorium) at the same temperature. But he explains—adopting therein, and following upon very conclusive personal experiments, the theory set out by Professor Féry, in 1902—that it is necesary (in order that the enormous calorific radiation of the cerite, which behaves like a dark body, may be transformed into luminous radiation), that the cerite be maintained at a high temperature. Now it is precisely this condition that is realized in the Auer mantle, by the mixture of the two oxides of thorium and cerium. The oxide of thorium, which forms the principal bulk of the mantle and gives off very little heat, stores it up in order to yield it by contact or convection to the cerite, which then is maintained at the temperature at which its intense radiation shows itself in a luminous form. In other words, the role of the thorina is merely to serve as a support to the radiant body, or, to use the expression of M. Sainte-Claire Deville, to keep the cerite hot.

To summarize, the primary condition for an incandescent mantle is for it to be constituted in the desired proportions by two sorts of bodies—one radiant body of great emissive power, and another warm body of very slight emissive power, which serves as a vehicle to the preceding one.

Improvements in Burners.

The mantle once invented, it was necessary to form the burner *ad hoc*—that is to say, the special bunsen burner intended solely to supply heat to the mantle, and to bring its temperature to the highest degree possible by incandescence. The construction of this burner has exercised, and still exercises, the ingenuity of inventors and manufacturers. Improvements in detail, allowing of bettering the conditions of the carrying in of the air, and therefore those of the combustion of the mixture of air and gas, play in fact a very important role, both as regards the good working of the burner and its efficiency—that is to say, the economy of its consumption. In principle, the arrangement of the burner ought to be such that the gaseous stream leaving by the inlet hole should produce a draught of air similar to a kind of Giffard injector. The intimate mixture of gas and air ought to be also studied. M. Denayrouze has, even in this direction (1895), gone as far as working mechanically the stirring up of the mixture by means of a small electric fan; but he soon gave it up, to use other more practical means. Bandsept (1896), in the same direction, sought to improve the burner by means of baffles, which produced the mixing of the two fluids; but the active force of the gaseous mixture was reduced, to the detriment of the efficiency. He then gave up using the baffles, to adopt adjustment by placing conical pieces on top of one another, so as to produce a progressive mixture of gas and air. Then, in the latest type, he interposes above the injector and the inside of the first of two cones, a piece forming a Giffard injector separating the two levels of the openings through which the air is introduced. By other arrangements, the Kern burner effects similar advancement. It also has an injector by which the gas sucks in the air; and the mixture first goes into a perforated strainer, and then into a chamber placed below the burner, and in which it is considerably heated. More recently, the Busquet burner, made by the Société Auer under a special mark, effects improvements of the same kind by two injectors, one above the other, the relative position of which is varied by means of a helicoid groove. By the combined play of the two injectors, regulation is thus obtained which allows of modifying and adjusting the volume of the flame to the mantle utilized. In all improved burners, in short, what is sought is to realize the best practical conditions to raise the temperature of the flame as much as possible.

Improvements in Mantles.

The mantles, like the burners, have also undergone improvements in details, and have become less fragile, &c., due to the care taken in manufacture, and to the purity of the oxides, &c. But the material of the mantle remains the same. It was only in 1904 that, by the Chardonnet process, known under the name of Plaissetty mantles, mantles with a base of artificial silk were substituted for those with a cotton base. These silk mantles have more cohesion, elasticity, and homogeneity, and this without increasing the mass, which is an essential point. In these mantles, the lighting power is a little higher, and, above all, it is maintained much more stable than in mantles of knitted material.

Extension of Incandescent Burners.

Incandescent gas-burners have been much longer in being adopted for public thoroughfares than for the interior lighting of houses; and the fact is well explained by the fragility of the mantles at their first appearance (1892). They were ill-fitted to resist the vibrations of the ground produced by the passing of vehicles; and there were difficulties relating to lighting up, and also in the price of the mantles themselves, which then cost about 3 frs. It will be understood that the maintenance, under such conditions, was very heavy. It was, however, quite tempting, by the substitution of an Auer burner of 115 litres (and even less) for a flat-flame of 140 litres, to quadruple at least the illuminating power, at the same time effecting an economy of 25 litres per hour, or nearly 100 cubic metres (3530 cubic feet) per year per lamp. Also, everyone tried everywhere in this direction, and, little by little, all the difficulties were overcome.

In 1894, there were lighted the Champs-Elysées, the Place de la Concorde, which made a sensation, the Place du Parvis Notre-Dame, the Place du Trocadéro, &c., with a thousand lamps. Each year the progression mounted up: In 1898, 2092 burners; in 1900, 19,256; in 1901, 41,303; in 1902, 48,962; and in 1905, 50,437. This is out of a total of 52,313 burners, independently of 3728 on private roads maintained by the City. The transformation was therefore all but complete in 1902.

The burners at the beginning were of 115 litres, rarely of 150 litres. Now they are of very variable consumption. In 1905, for example, there were:

1,906	burners	below 100 litres.	
41,167	,,	of 100 ,,	(more than four-fifths).
124	,,	of 120 ,,	
4,897	,,	of 150 ,,	
2,032	,,	of 150 to 300 litres.	
311	,,	of 300 to 750 ,,	

Soon burners of different systems (Lacarrière, Denayrouze, Kern) of only 80 litres will be put up in Paris. We wish, on the other hand, that at the cross-roads, and in the squares, &c., the intensive incandescent gas-burners would be increased, as they have been adopted with success for shop entrances, café terraces, &c., as well as for factories and workshops. With consumptions of from 450 to 700 litres, intensive burners can be had which rival the electric arc—that is to say, they give an intensity of from 40 to 60 carcels. The Provinces have, of course, followed the movement, and generally, public thoroughfares are lighted by incandescent gas-burners everywhere.

Such is the much abridged summary of the progress of incandescent gas since its discovery. As to the results of it, which we have enumerated, they may be expressed as being, since 1892, an economy of about 50 per cent. in the consumption. Burners No. 1 of 75 litres, and No. 2 of 115 to 120 litres, which were then the most general, consumed from 20 to 25 litres per carcel. The improved burners, like those of which we have spoken, now give the carcel for practically 10 to 12 litres, and even 8 to 10 litres in the laboratory. There is, in addition, the whole gamut of various intensive (or high pressure) burners from 30 litres up to 700 litres and more.

Gas and Electricity Compared.

It is of interest to try and compare incandescent gas and incandescent electricity from the point of view of expense. Adopting, for example, the respective base prices of 20 c. per cubic metre for gas, and 8 c. per hectowatt for electricity—these two base prices being average prices, which could both be lowered proportionately without much altering the comparison—we have:

For the gas carcel-hour: $\frac{10 \text{ litres} \times 0{\cdot}20}{1000} = 0{\cdot}002$ frs.

For the electric carcel-hour: $\frac{30 \times 0{\cdot}08}{100} = 0{\cdot}024$ frs.

(at 3 watts per candle or 30 watts per carcel).

The cost of gas is, therefore, twelve times less. With a less perfect incandescent burner, giving the carcel for 12 to 13 litres instead of 10 litres, the cost would still be about ten times less for gas than for electricity.

These figures, which are very conclusive from the point of view of saving in money, and which explain so well, if the expression may be allowed, the *democratization* of gas, which is more and more marked, show, on the other hand, that economy is not everything in the question of light. Luxury, decorative appearance, easy division of light, facility of lighting up, are paid for like other things; and there is need to recognize the superiority of the electric light on these interesting points. But progress links up and leads on; and gas has also sought to follow electricity into the decorative domain, if it may be thus expressed. The inverted burner, invented only a few years ago, under various names (Farkas, Liais, Rieder, &c.) now enjoys a great vogue, precisely because of the special decorative applicability of which it is capable.

Inverted Burners.

In these burners, the flame leaves the burner vertically from top to bottom, and renders incandescent a mantle in the form of a spherical crown, with the convex side turned to the ground. The burner, being above the incandescent surface, does not throw any shadow on the objects placed below it. The radiation from top to bottom is rational. It gives, in the main, an analogous result to that formerly obtained in certain regenerative burners, called Wenham burners, and also to that in incandescent electric lamps. With inverted burners, it is easy to get elegant fittings with ground-glass tulips, &c., such as pendants, chandeliers, &c.—advantages to which must be added the undoubted attraction—we say it—of imitating the electric light so correctly *à la mode*. It is this type of burner which has been particularly adopted by the Compagnie des Chemin de Fer de l'Ouest for lighting their waggons with ordinary coal-gas, compressed to 15 kilos. in the cylinders. A regulator reduces the pressure of the gas at the burners to 180 millimetres, and, with only 40 litres consumption per hour, there are obtained more than 32 candles—actually flooding the compartment with light. However that may be, it is right to say that, since the development of incandescence, and, above all, with the assistance of inverted burners, gas can defend itself even in the decorative department; and it has gained admittance in average bourgeois houses, into dining rooms, and even drawing rooms,

from which it seemed to all ever banished with the old flat-flame burner, relegated as it then was to kitchens or halls.

Progress in Efficiency of Gas-Burners.

Will you permit me now, returning to the past, to throw a retrospective glance on the technical progress of lighting by gas during the period which has seen the birth and development of electric lighting—that is to say, about 25 years. The results are summarized in the following table giving, for successive types of burners, the consumption in litres per hour, the lighting power produced in carcels, and the consumption per carcel and per hour.

		Consumption in Litres per Hour.	Lighting Power in Carcels.	Consumption in Litres per Carcel per Hour.
Before 1878 Flat-flame burners	1st series	100	0·77	129
	2nd series	140	0·10	127
	3rd series	200	1·72	116
Round burners, Bengel type		105	1	105
Intensive burners without regeneration (Rue du Quatre-Septembre, &c., type)		1400	14	100
Regenerative burners		350	4 to 5	70
		750	13 to 15	50
		1000	20 to 22	40 to 45
Incandescent burners	ordinary	100	5 to 6	16 to 20
	improved	variable	—	10 to 12
	intensive	300 to 700	30 to 70	9 to 10

Thus, therefore, whereas in 1878 we had only burners giving the carcel for 125 to 130 litres, and able only to reach the power of a few carcels, we now have, at the present time, burners giving the carcel for 10 to 12 litres—that is to say, ten times less. The efficiency has therefore increased ten-fold at the same time that we have been able easily to get lights of great power. Can it be said then, of this industry, that it has not marched with progress? There are not many industries which in a few years have seen realized such increases in efficiency, and it is a statement which I felt bound to put before you, with figures in support of it.

To sum up, the reduction in the consumption of improved burners has been one of the most profitable things to the consumer. As to the reduction in the price of gas—this famous question, which is always talked about but which is so little solved, in Paris at least—one would like to remark that the reduction of 40 to 50 per cent. on the price per cubic metre, which represents the maximum demand of the consumer, is a small thing alongside the reduction of 90 per cent. in the consumption which has been procured for him, solely by technical progress in lighting.

Consumption of Gas in France.

After having rapidly passed in review before you the successive stages and the principal advancements in lighting by gas, I now come to the present state of the gas industry in France and abroad. Has the very large place which the electric light has so rightly taken in the general world of modern lighting checked the progressive march of the gas industry? Is it not to be supposed that the latter will soon have to give place to its brilliant rival? Such is the question that was put, and is still put by independent minds. It is one to which hardly any answer can be given except by a statement of figures carefully selected. Forgive, then, a few statistics.

At the Exhibition of 1889, in the official report of the Jury on Lighting, I showed a consumption of 620 million cubic metres for the whole of France, with 1028 communes lighted by gas, having a population of 12,750,000. It is in fact during this period —that is to say, during about 15 years—that the electric light has really developed. I remind you in particular that it was in 1889 (April) that the first concessions were given to the Electric Companies or *Secteurs* of Paris, and that it was only after 1889, with some exceptions, that the Provinces, little by little, followed the movement started in the capital. This development, in Paris, for example, is shown by the following figures:

Year.	Consumers.	Arc Lamps.	Incandescent Lamps.	Kilowatt-Hours Consumed.
1889	216	469	19,380	480,986
1899	19,815	12,572	840,959	17,903,668
1905	41,708	16,964	1,551,660	34,368,312

So that it is precisely in this same period that the development in the consumption of gas is shown also in the most striking way; it being thus parallel to that of electric lighting. Replacing official gas statistics, which are wanting in France, by estimates and personal information, we reach an actual gas consumption for the whole of France of about 900 million cubic metres, which is more by nearly 50 per cent. than the consumption in the year 1889, and is applied to a population of about 13½ million inhabitants out of 39 millions.

If we now make our comparisons as regards Paris, instead of for the whole of France, we shall see that, in the last decade, the consumption passed from 270 millions in 1897 to 350 millions in 1906—that is, an increase of 30 per cent., in spite of the rapid progress of electric light. If the consumption is brought down to the basis of per inhabitant, which is the most interesting form because it takes the variation of population into account, the consumption per head passes then from 105 cubic metres in 1897 to 130 cubic metres in 1906. Large towns in France which I might cite have undergone similar developments. I will name Lyons especially, because of the considerable electrical increase that has occurred there, owing principally to the utilization of the Rhône for motive power. The gas development there is stated to be more than 40 per cent. increase for the last known ten years, and the present consumption per head is nearly 80 cubic metres. Let us now look abroad.

Consumption of Gas in Other Countries.

England.—Of all countries in the world, England is the biggest consumer of gas in proportion to its population. The production is quite five times that of France, or more than 4000 millions of cubic metres. London consumed, in 1890, 748,000,000 cubic metres, and in 1905, 1,022,000,000 cubic metres. This is an increase of 274,000,000 cubic metres, or 36 per cent. The latter figure (of consumption) corresponds to about 180 cubic metres per inhabitant—a figure which is much higher than that of Paris. Industrial towns, such as Manchester and Birmingham, reach even nearly to 250 cubic metres per head. These figures show sufficiently—though one must not forget to take into account the differences of climate, the commercial character of the towns considered, local habits, price of gas, &c.—how far we are in France from the "limit of saturation" (excuse the barbarous expression) of the consumer.

Germany.—The use of gas is also greatly developed in Germany; and here is the progress in consumption for the last specially considered decade, in three large towns amply supplied with electricity, which are quoted as examples:

Berlin: In 1894, 111,000,000 cubic metres.
In 1904, 212,000,000 ,, ,,
That is an increase of 101,000,000 ,, ,, or 90 per cent.

Hamburg: In 1894, 41,000,000 cubic metres.
In 1904, 67,000,000 ,, ,,
That is an increase of 26,000,000 ,, ,, or 63 per cent.

Cologne: In 1894, 24,000,000 cubic metres.
In 1904, 40,000,000 ,, ,,
That is an increase of 16,000,000 ,, ,, or 66 per cent.

These figures correspond to a consumption of from 90 to 110 cubic metres per inhabitant.

Belgium.—Very complete figures are known for Brussels, or, more accurately, for the combined Brussels districts, which are, it is true, particularly densely populated.

Brussels: In 1895, 30,000,000 cubic metres.
In 1905, 43,000,000 ,, ,,
That is an increase of 13,000,000 ,, ,, or 43 per cent.

The last figure of consumption corresponds to one of 224 cubic metres per inhabitant.

Holland.—As for Germany, I take as examples the figures of three large towns, which I have been able to obtain for the last five years:

Amsterdam: In 1899, 34,600,000 cubic metres.
In 1904, 62,200,000 ,, ,,
That is an increase of 27,600,000 ,, ,, or 79 per cent.

Rotterdam: In 1899, 24,700,000 cubic metres.
In 1904, 35,300,000 ,, ,,
That is an increase of 10,600,000 ,, ,, or 42 per cent.

The Hague: In 1899, 20,200,000 cubic metres.
In 1904, 32,400,000 ,, ,,
That is an increase of 12,200,000 ,, ,, or 60 per cent.

These figures correspond to 100 to 130 cubic metres of consumption per inhabitant.

Sweden. — Stockholm: In 1894, 15,300,000 cubic metres.
In 1904, 29,800,000 ,, ,,
That is an increase of 14,500,000 ,, ,, or 94 per cent.
The last figure corresponds to 94 cubic metres per inhabitant.

Denmark.—Copenhagen: In 1894, 27,100,000 cubic metres.
In 1904, 52,500,000 ,, ,,
That is an increase of 25,400,000 ,, ,, or 94 per cent.
The last figure corresponds to 124 cubic metres per inhabitant.

Switzerland.—Zurich: In 1898, 9,780,000 cubic metres.
In 1905, 20,176,000 ,, ,,
That is an increase of 10,396,000 ,, ,, or 106 per cent.
The last figure of consumption corresponds to 120 cubic metres per inhabitant.

Basle: In 1894, 6,060,000 cubic metres.
In 1904, 14,337,000 ,, ,,
That is an increase of 8,227,000 ,, ,, or 136 per cent.

Geneva: In 1894, 6,900,000 cubic metres.
In 1905, 8,830,000 ,, ,,
That is an increase of 1,930,000 ,, ,, or 28 per cent.
The consumptions vary between 80 and 120 cubic metres per inhabitant.

Italy.—Milan: In 1895, 24,100,000 cubic metres.
In 1905, 52,700,000 ,, ,,
That is an increase of 28,600,000 ,, ,, or 118 per cent.
Consumption about 100 cubic metres per inhabitant.

Rome: In 1895, 13,900,000 cubic metres.
In 1905, 19,800,000 ,, ,,
That is an increase of 5,900,000 ,, ,, or 42 per cent.

I can also, for these two Italian cities, give the corresponding development of electric lighting, which has been considerable:—

Milan: In 1895, 26,317 incandescent electric lamps and 978 arcs.
In 1900, 47,211 ,, ,, ,, ,, 1332 ,,
In 1905, 235,027 ,, ,, ,, ,, 3212 ,,

Rome: In 1895, 51,100 incandescent electric lamps.
In 1905, 213,884 ,, ,, ,,

These examples, which I could add to, are sufficient to show that the gas industry has never been more progressive than

during the same period as the development of the new method of lighting by electricity. This result may appear surprising, and it is interesting to analyse it.

Reasons for the Progress of Gas.

In the first place, the coming of the electric light had, as a first result, the general raising of the level of artificial illumination. Light calls for light. The inevitable tendency was, from that time, to demand more from the other known methods of illumination which were to hand, and especially from gas, which was in possession with its installations ready and its new methods of working, which we have passed in review, arising principally from the invention of incandescent burners, which at once gave greater lighting power and economy.

We would also say that frequently the electric light is a partial addition to, rather than a total substitution for, gas. Gas companies so well understood this that, abandoning their prejudices and first-hour struggles, many of them boldly threw themselves into the new path that was offered to them by the electric light, and did not hesitate to seize the opportunity of new agreements to turn themselves into general lighting companies, offering at the same time to their customers, under specially simple conditions, the choice between gas and electricity. This was the case in many large towns in France; and I may mention at the head of them the three largest, Marseilles, Lyons, and Bordeaux.

Heating by Gas.

I must take care not to forget the more and more spreading intervention of gas for the usages of domestic heating, cooking, &c., which makes it an indispensable auxiliary of modern comfort, and is so well adapted for moderate establishments, which we should not forget are the most numerous. This application of gas, though well known from the beginning, has only really been put into extensive practice in the last few years, and especially since reduced prices became general in France. The advantages of gaseous fuel, piped under the public street and arriving at the floor in any quantity asked for, in place of coal which it is necessary to cart, store, carry up, &c., do not any longer require proof. A day will come when the coalman carrying the coal upstairs will follow the fate of the water-carrier that we saw in our youth bearing the two traditional buckets on his broad shoulders. Civilization involves, let us not forget, mains as much for heat, light, &c., as for water. There are, therefore, to be considered, in order to have correct ideas on the matter, during the period we have especially examined, two distinct progressions; the progress of lighting and the progress of heating.

Statistics of Lighting and Heating by Gas.

In France, the ascertaining of particular figures for each of these two usages is very often difficult of achievement. They are estimated rather than measured by the quantities of gas sent out during the day and those sent out at night. This is only an indication, a simple probability and sometimes even erroneous. Rather more precise statements can only rarely be obtained from towns in France, but frequently from abroad (Germany, Switzerland, &c.), where, different prices being allowed for lighting purposes and for heating, two distinct meters register separately the respective consumptions.

I will spare you the rather cumbersome statistics which I have collected on this subject; but in order to summarize them, I will simply put before you, as an example, the separate progress of the consumption of gas in two large towns abroad, taken as modern types of towns (I emphasize this point) in which the electric light is extensively developed:—

Year.	Town I.		Town II.	
	Lighting. Cubic Metres.	Heating. Cubic Metres.	Lighting. Cubic Metres.	Heating. Cubic Metres.
1896 . . .	11,764,000	13,813,000	4,945,000	1,727,000
1897 . . .	11,840,000	15,488,000	5,353,000	2,402,000
1898 . . .	12,262,000	17,483,000	6,012,000	3,048,000
1899 . . .	12,364,000	19,195,000	6,729,000	3,844,000
1900 . . .	12,993,000	21,932,000	7,220,000	4,619,000
1901 . . .	12,775,000	24,227,000	7,108,000	6,264,000
1902 . . .	13,827,000	28 226,000	6,684,000	7,724,000
1903 . . .	14,278,000	30,706,000	7,044,000	9,152,000
1904 . . .	13,960,000	31,650,000	7,940,000	10,416,000
1905 . . .	13,884,000	33,474,000	7,884,000	11,597,000

As will be seen by these examples—and I could cite many others—the considerable increases experienced in the later years are due, particularly in large towns, to the adoption of heating, stimulated by important reductions in the price of gas. This large field of action is far from being exhausted. In the sphere of lighting, the progress has been more modest, and clearly shows that there is competitive ground on which the two rival lights meet, which have to reckon with their respective qualities, as with the progress accomplished and to be accomplished.

The Future.

On the gas side, we can still discount the effect of new improvements in incandescent burners, and of fresh reductions in price, both of the cubic metre and of the accessories—especially if the towns do not put forward pretentions for exaggerated royalties, as in Paris, where they exceed 7 centimes per cubic metre—so that in a word, there may be brought by one pipe to the humblest household, at the same time, the benefits of both light and heat under undisputable economical conditions.

On the side of electricity, we can also discount the lowering of the price per hectowatt, which is becoming general everywhere, and which, especially in Paris, is only a question of hours; and also the progress of incandescent lamps, which have recently been put before us so admirably by our colleague, M. Larnaude. It is by carefully following these improvements and measures that reasonable forecasts for the future can be made, rather than by relying on facts of the past in order to build up ready-reckoners which have never been really mathematical.

We who are here as free engineers, devoted above all to progress, have to rejoice at these struggles, at this constant march towards that which is "better." There is room for everybody in the vast field of lighting; the scope of light is, as we said at the beginning, indefinite—gas, petroleum, acetylene, electricity, &c. There will never be enough sources of light to suffice for the ever-increasing needs of the modern man, who desires, at his will, to be able to do away with night, as by the telegraph and telephone, he has already succeeded in doing away with distance. It will be the honour of many among you to have participated, in different spheres of action, in the characteristic evolution, accomplished in the last century, which has so justly obtained for it the name of the "Century of Light."

A MODERN PHASE IN THE MANUFACTURE OF SULPHURIC ACID.

By H. Leicester Greville, F.I.C., F.C.S., &c.

A recent paper read before the Society of Chemical Industry* by Mr. W. H. Colman—on "A Graphical Method of Recording the Work of Vitriol Chambers"—recalls to my mind some general considerations concerning the manufacture of sulphuric acid. It is almost needless to call attention to the importance of sulphuric acid to all gas-works manufacturing sulphate of ammonia—whether they are purchasers of the acid from outside sources or are (as at present in many large works) their own manufacturers. The paper I have alluded to is of too technical a character to admit of a brief description—suffice it to say that, by a careful daily observation of all the salient details which effect efficiency and economy in manufacture, the author frames a chart which enables a graphic appreciation to be made of the general working, and a comparison *de die in diem*.

The present short article is not intended to, in any way, discuss the well-known chamber process of sulphuric acid manufacture, but to call attention to a comparatively modern innovation which does not apparently seem to have met with the recognition which might have been expected, and of which a few brief comments may be of possible use and interest. The method to which I allude is the so-called "Contact" or "Catalytic" process, where certain metals or metallic oxides are used for the conversion of sulphur dioxide into sulphur trioxide.

Digressing to the present ordinary method of manufacturing sulphuric acid, sulphur dioxide is formed by the combustion of sulphur-laden materials in contact with air (pyrites, spent oxide, &c.). The sulphur dioxide in contact with free oxygen, steam, and nitrous vapours is eventually converted into sulphuric acid. The function of the nitrous vapours (higher oxides of nitrogen) is to act as oxygen carriers to convert the SO_2 into SO_3. This reaction necessitates comparatively long contact; so that the reacting gases have to be allowed full play in a series of large and expensively constructed lead chambers. Moreover, as the nitrogen oxides are necessarily expensive, special apparatus has to be used to prevent loss, and for their recovery. All this is, to many, common knowledge; but a brief recapitulation may possibly make comments on the so-called "contact process" clearer.

In the last edition of Professor Lunge's work, on "Sulphuric Acid," of which a brief review appeared in the "Journal,"† considerable prominence was given by the author to the "catalytic" process of sulphuric acid manufacture. I have unfortunately not the book for reference, but made one or two notes at the time I read it. In brief, at certain temperatures the oxides of copper, iron, and chromium have the faculty of immediately effecting the union of SO_2 with O to form SO_3. Finely divided platinum is the most active agent; but its excessive price rather tends to make its extensive use somewhat prohibitive. Professor Lunge is inclined to the belief that the so-called catalytic action is due to a function of oxidation and deoxidation. Thus, in the case of iron, he gives the reactions—

$$1.—3\ Fe_2O_3 + SO_2 = 2\ Fe_3O_4 + SO_3$$
$$2.—2\ Fe_3O_4 + O = 3\ Fe_2O_3$$

In the case of platinum, the effect is not so clear; but it is quite possible that some form of alternate oxidation and reduction may take place.

Oxide of iron requires a comparatively high temperature (a low red heat) to effect the union of SO_2 with O; and the complete reaction never occurs even under the most favourable circumstances. With platinum, however, the reaction is complete under the best conditions so far as to practically reach theoretical

* "Proceedings of the Society of Chemical Industry," Dec. 31, 1906.
† Vol. LXXXIV., pp. 409, 471.

limits. Experiments made by the author prove that while a certain temperature is necessary, excess of heat causes dissociation—viz., that the SO_3 molecule breaks up into $SO_2 + O$.

An experiment showed that the first evidence of the combination of SO_2 and O started at 200° C.; increasing rapidly with rise of temperature. At 380° C., a conversion of SO_2 into SO_3 amounted to 98 to 99 per cent., continuing up to 430° C. A further increase in temperature resulted in dissociation setting in, so that between 700° C. and 750° C. there was only 60 per cent. conversion; while at 900° to 1000° there was no action. With a mixture of ferric and cupric oxides, there was a 10 per cent. conversion at 400° C.; a 35 per cent. at 500°; and a maximum of 45 per cent. at 550°.

Since the production of Professor Lunge's treatise, the contact process has come into practical use in America. I have, however, no later statistics than those published early in 1906.

The Verein Chemischer Fabriken Company adopt a method which utilizes oxide of iron as the main agent for converting SO_2 into SO_3—the final reaction being effected by platinum.

It appears necessary in the commercial working of the process that (contrary to the ordinary chamber method) moisture must be excluded. The combustion of the sulphur-laden material is effected by air dried by the strong sulphuric acid produced in the course of manufacture. The combustion products (SO_2 and excess of air) pass to a shaft containing pyrites cinders (crude oxide of iron). The gases have sufficient heat to maintain these at the necessary temperature to convert a certain proportion of the SO_2 into SO_3; while any arsenic is retained in combination with the iron. The sulphuric anhydride is condensed; and, eventually, the remaining unchanged SO_2 is converted into SO_3 by contact with heated screens of platinized asbestos. The claims are that by the process a conversion of 95 per cent. of the original SO_2 into SO_3 takes place.

The practical statistics given are that one plant was installed at Buffalo, N.Y., in 1903, with a capacity of about 1600 tons of acid. This has since been enlarged fourfold. Four other firms have since adopted the process with a capacity of 35,000 tons, and plant (in course of construction) to yield a further 16,000 tons. I am simply quoting published figures. Unfortunately, no statistics are given as to cost of manufacture; but looking at the science of the question, the more modern method would seem cheaper than the old-fashioned lead chamber system of sulphuric acid manufacture, with its costly apparatus, its constant necessary expenditure of nitre, and its continual careful supervision.

A REINFORCED CONCRETE RESERVOIR.

A RECENT number of "Engineering Record" contained an illustrated article by Mr. Bertram Brewer, the City Engineer of Waltham (Mass.), on the construction of a reinforced concrete reservoir for the supply of the town. The water comes from an underground source, and is pumped from a large well near the Charles River. The original works, completed in 1873, included an open well and filter gallery with an open 6 million gallon reservoir on a hill about 1500 feet to the north. The objectionable growths common to underground waters when exposed to light soon appeared; and in 1893 the well and gallery were covered, and in 1906 a new covered reservoir was built and put into service. The authorities were aided in their decision as to the kind of structure to build by having before them complete plans and estimates. A covered concrete reservoir of a familiar type, circular, buried in the earth, and large enough to contain 2½ million gallons of water, was estimated to cost about $14,000. This would require taking considerable additional land. A steel tank, 100 feet in diameter and about 36 feet high, would contain a little more than 2 million gallons, and would cost about $30,000. Such a structure would require a considerable outlay for maintenance; but it could be built mostly on water-works land. Plans were prepared and a thorough investigation was made into the cost of a concrete structure of dimensions similar to a steel stand-pipe, and, like it, to set above the ground. This last design was finally adopted, and the concrete reservoir has been built at an actual cost of $25,556.

The reservoir rests mostly on ledge. The bottom is 12 inches thick, reinforced with a layer of expanded metal near the surface. The floor is trowelled to a granolithic finish. Bent rods, spaced every 12 inches, were placed in the base. They extend 6 feet into the base of the reservoir, and 3 feet up into the wall. The walls are 18 inches thick at the bottom, the inside vertical and the outside battering 6 inches; making the thickness at top 12 inches. Enough steel reinforcement was used in the walls to keep the tensile stress within a 12,000 lbs. limit. The rods were arranged in three rows up to 20 feet and then in two rows in the next 17 feet. The roof consists of a reinforced concrete slab 3 inches thick, supported by steel trusses radiating from a central concrete-covered pipe column, which serves also as an overflow. These trusses are 3 ft. 8 in. high at the outside ends, and an ornamental enclosure wall was built up round and above them—making the total height of the side walls 43 feet. Except in the foundations and lower 6 inches of the floor, which was composed of a 1 : 3 : 6 mixture, the concrete was proportioned at the rate of 100 lbs. of cement to 2 cubic feet of sand, 4 cubic feet of stone, and 5 lbs. of hydrated lime. The walls were reinforced with 1⅛-inch round rods; and the jointing of the rods was made in every case by a lap of 40 diameters. The cement was required to conform to the standards for portland cement adopted by the American Society for Testing Materials; and the Contractor used Lehigh cement. Most of the stone and all the sand was screened from a gravel bank not far from the site.

As most builders have found to their cost, there are certain inherent difficulties in manufacturing concrete which usually render it permeable to water. It was therefore with great study and care that the plans and specifications for the reservoir were prepared. In the American climate, it is perhaps not so much a question how to stop all percolation as it is to reduce it to so small a quantity as to avoid injury from frost. The peculiar, if not unusual, precautions taken to make the building a success may be grouped under the following six heads: (1) As to the character of the sand and gravel which entered into the aggregate. (2) As to some waterproofing material or compound to be added. (3) As to the method of placing the steel and holding it in position. (4) Forms. (5) Making the joints and caring for the concrete as it set. (6) Interior finish of the walls.

For waterproof work, Mr. Brewer employed gravel up to 1½ inches in diameter; using by choice the rounded pebbles, because they pack more easily and made a denser concrete. Mechanical analyses of the sand and gravel were made, and specified proportions of maximum and minimum sizes were adhered to throughout. Permeability tests were carried out of two waterproofing materials on the market. Both notably increased the impermeability of the concrete; and it was decided to use the lime in the body of the concrete to the extent of 5 per cent. of the weight of the cement, because it gave excellent results and was cheap. The steel was rolled to the required radius on the ground, and placed in the angles of open lattice-work perpendicular steel supports as the wall was built up; the ends being tied together with wire where found necessary in order to keep them from sagging.

The forms were erected in complete sections 3 feet high. They were about 5 feet long; so that it took sixty to make the circle. The difference in lengths due to the batter of the outside of the wall was adjusted as the building progressed. The outer and inner portions of each section were tied together with four ½-inch bolts. These were in three sections. The middle one, with the two heads into which it was screwed at either end, was permanently built into the wall; while the two outer ones were unscrewed from the other ends of the heads upon removing the forms.

The contractor built two complete sets of these forms, or really enough for 6 feet of wall. In making the joints, the old surface was thoroughly cleaned with steel brushes down to hard material, and then washed out with a hose. The old work was wetted down, and a layer of neat cement grout brushed in immediately before adding the concrete. New concrete was kept covered and wetted down daily for a month; but no attempt was made to fill the reservoir until it was completed. The first 10 feet of the inside wall was plastered with a mixture of sand, cement, lime, and Medusa compound, and the remainder received at least two brush coats of a mixture of sand, cement, and the compound.

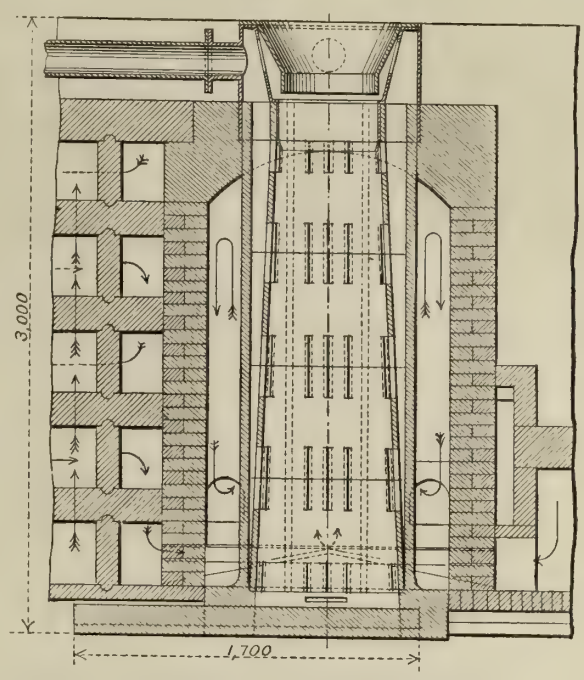
Every structural difficulty was met as Mr. Brewer had expected to meet it before he began. There was no movement whatever in the forms, and it was not at all difficult to secure the battered walls. The rounded stones were easily packed into position; and there were no poor sections of concrete and no leaks. A lack of suitable pumping facilities greatly delayed the progress of the work; and as a result of this, and an insufficient water supply, there was considerable seepage at the joints. Up to the present time no effort has been made to add to the treatment already described which the inside walls received when they were first built, with the exception of another brush coat at the joints. In a letter to the City Government last February, when preparations for the work were in progress, Mr. Brewer stated that, if the plans and specifications were carried out, he believed it was possible to get a concrete reservoir water-tight, except for a certain amount of seepage, which would be so small as to do no lasting harm to the structure in the course of its legitimate use. He says the actual results have fully justified this statement.

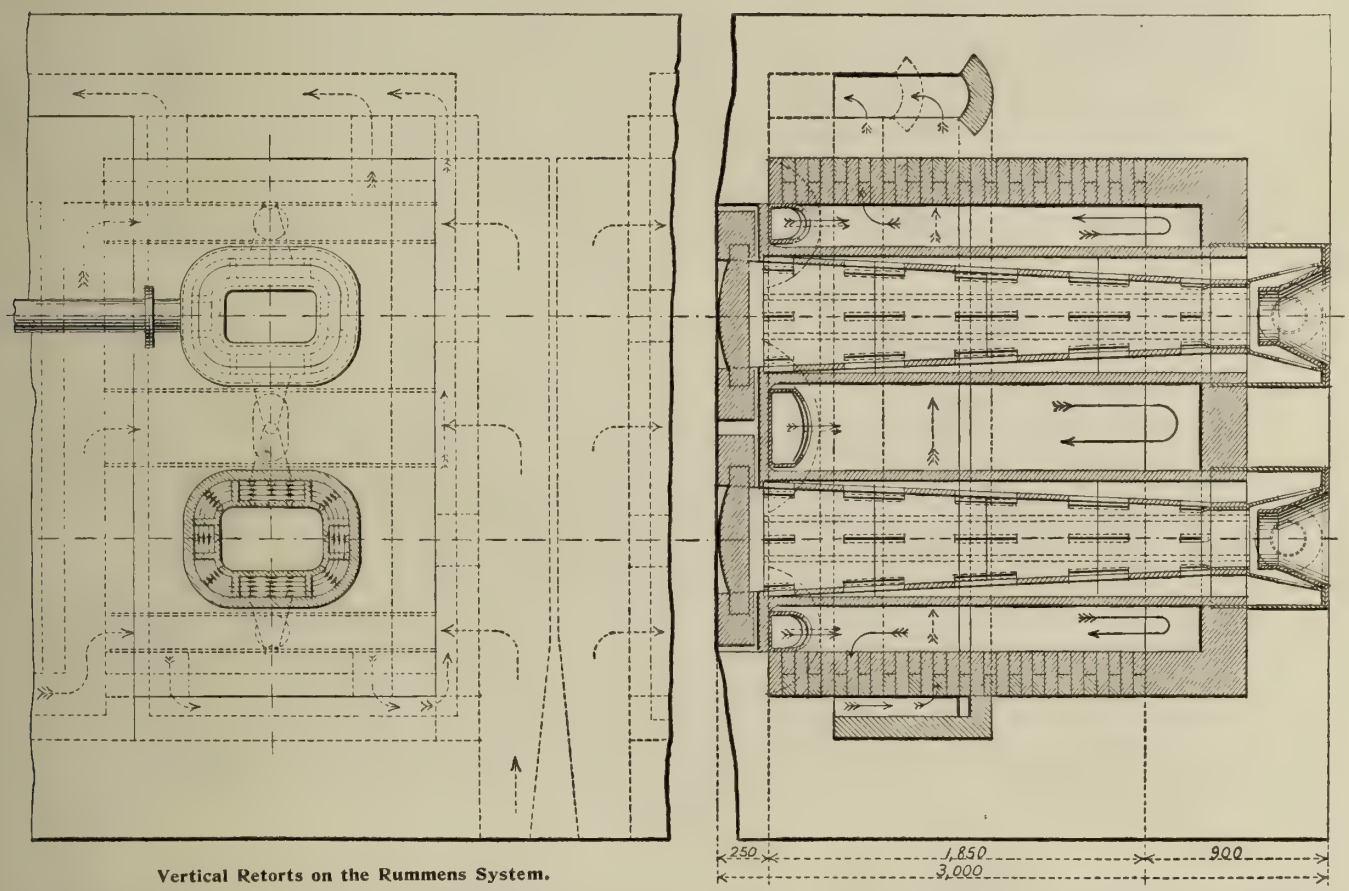
Reports of Gas Associations for 1906.—It will be seen, from an announcement which appears elsewhere, that this volume is now ready. It is an addition to the series of collected transactions of the District Associations of Gas Engineers and Managers commenced in 1883, and it contains the reports of the proceedings of these bodies in the past twelve months. In the volume for 1905, the newly-formed Institution for Wales and the Monmouthshire district was included; in the one just issued will be found the South-East of Ireland Association. The matter extends to 602 pages, compared with 588 and 482 pages respectively in the two immediately preceding volumes; and it is illustrated by two plates, 27 figures, and a number of diagrams. A list of these is given, as well as a general index to the contents. The reports are followed by lists of the officers and members of the several Associations. The volume is neatly bound in cloth, and presents, in a convenient shape for reference, the past year's work of the Provincial organizations of gas managers, as recorded in the "JOURNAL." It consequently forms a companion to the Transactions of the Institution of Gas Engineers.

THE RUMMENS SYSTEM OF VERTICAL RETORTS.

About this time last year, we described and illustrated an arrangement of vertical retorts by M. Rummens, of Brussels, by which he is able to produce simultaneously ordinary coal gas and carburetted water gas. M. Rummens has devoted considerable attention to this subject, believing as he does in the employment of every method of reducing the cost of gas manufacture to the lowest limit, so as to allow of the consumer being supplied as cheaply as possible. A short time ago, he attended a meeting of the section of the Brussels Chamber of Commerce dealing with public works and the application of science to the industries, and explained the construction of his furnace.

In the course of his introductory remarks, he directed attention to the close connection between the use of vertical retorts and the economical production of gas, and referred to the installations at Dessau and Mariendorf, and to the well-known labours of Dr. Bueb and Herr Drory. He said that Dr. Bueb's system, as originally introduced, was attended by certain inconveniences which had been criticized in England; but the results obtained at the two places named, with new settings which had no special arrangement for the lateral escape of the gas, were very satisfactory. The production of gas per ton of coal carbonized was rather higher than that obtained with ordinary settings, while the residuals were more abundant and of better quality. In his (the speaker's) opinion, Dr. Bueb had demonstrated the possibility of employing vertical retorts without having to fear the inconveniences which had caused them to be abandoned in the early days





Vertical Retorts on the Rummens System.

of the gas industry. But while these defects were less serious than had been supposed, they still existed; and he thought there was a way of avoiding them entirely by other arrangements than that of the side channel (so located as to be unaffected by the heat), which Dr. Bueb had devised, but which had not been successful.

At the close of his preliminary observations, M. Rummens proceeded to describe his system of setting vertical retorts, for which he has taken out patents in Belgium, France, England, Germany, and Austria. It is shown in the accompanying illustrations. He pointed out that in his setting the single side channel which Dr. Bueb had given up is replaced by a special arrangement consisting of double side walls for the retorts and of a single hollow mouthpiece surrounding them; the whole being so devised that at the commencement of carbonization the gas produced can escape sideways up the entire height of the retorts by means of openings made between the walls, and afterwards pass away by the central core of coal, when this is contracted as the result of the formation of a layer of coke at the periphery, which has produced therein apertures sufficiently large for the easy passage of the gas. This may escape during the entire period of carbonization without having to traverse a superheated layer of coal, which would cause the destruction of the light hydrocarbons constituting the most valuable properties of the gas from the point of view of its illuminating power.

The arrangement of furnace described by M. Rummens permits, as he claims, of economy being effected in the distillation of coal, inasmuch as vertical retorts lend themselves better than either horizontal or inclined ones to mechanical charging and to the easy removal of the coke. It dispenses with the separate installation of plant at present employed for the manufacture of water gas for mixing with the coal gas, by producing the former in the same retort as the latter, utilizing for the purpose the heat now lost in the incandescent coke drawn from the retorts. In this way a second reduction in net cost—not by mixing with the coal gas as large a quantity of water gas as possible, but by putting in only a limited quantity, obtained without expense, and mingled with the coal gas at a high temperature, as produced. The retorts are arranged side by side in one or two combustion chambers. They have a movable bottom and, as already stated, double side walls, the outer one of which is plain and vertical, while the inner one is perforated and widened towards the bottom so as to facilitate the discharge of the incandescent coke, and to allow a free space between the walls for the lateral escape of the gas, without having to pass through the mass of carbonized coal. Under each of the retorts is a closed chamber for the reception of the coke, furnished with a vaporizing apparatus for producing, by the injection of water, the steam necessary for making a limited quantity of water gas. Each vaporizer is composed of three concentric tubes surrounding a solid iron core; the tubes being separated

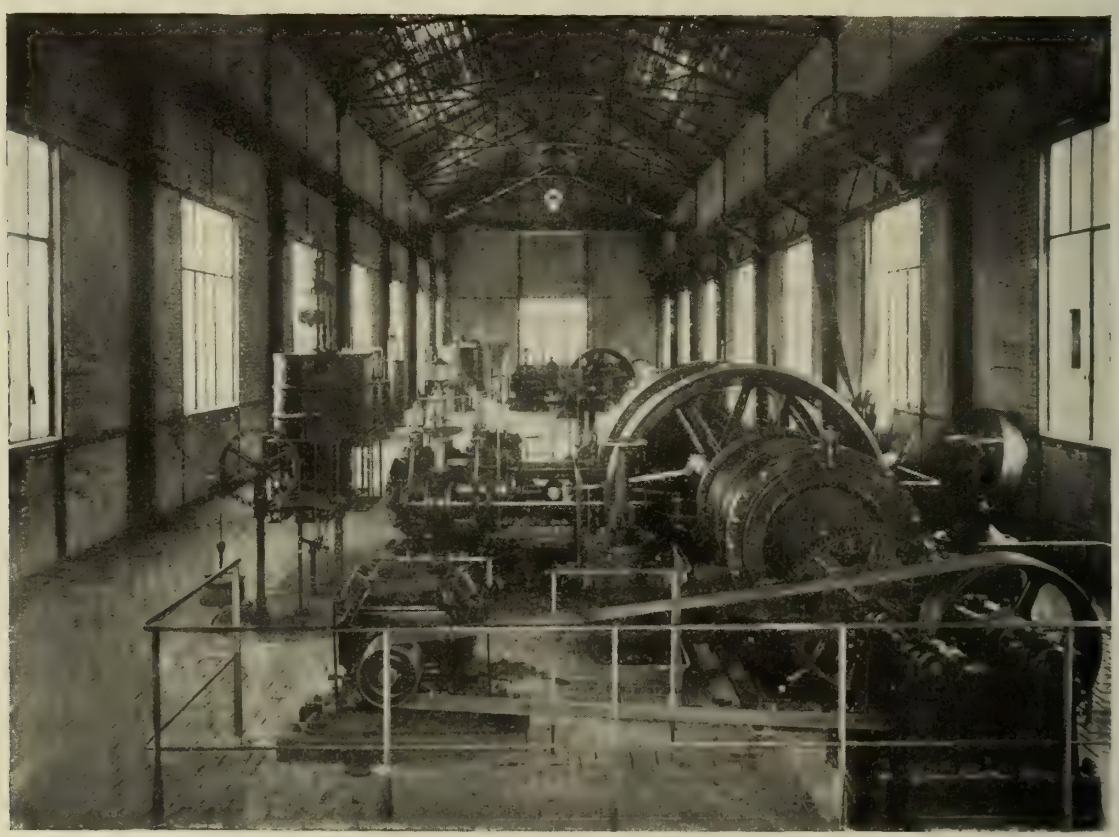
by small spaces into which is injected the water to be vaporized. The steam produced escapes by two horizontal pipes at the bottom of the apparatus, and is led directly into the retort, to be decomposed therein at a high temperature by the coal undergoing carbonization. Whatever may be the number of the retorts, they can be charged simultaneously and rapidly by the automatic charger with which the setting is furnished. It is provided with a number of receptacles which are alternately open and closed at the top and open at the bottom, and which, by a slight displacement, close or open the coal-hoppers located above each retort. While one charge is being worked off, the coal required for the next can be put into a hopper.

M. Rummens described, by means of diagrams, the various details of an experimental setting embodying the principles he enunciated, and explained its working. It only remained, he said, to demonstrate practically the value of his system by having the setting erected; and for this purpose the Communal Administration of St. Gilles had granted him a sum of 10,000 frs., for which he cordially thanked them. He was now seeking the means of testing his system on a working scale; and this would entail an expenditure of a larger amount than he had received. Moreover, it was indispensable that a gas-works should be placed at his disposal.

The President (M. Verstraeten) thanked M. Rummens for his interesting discourse, and wished him success in carrying out the trials which his system would have to undergo before its practical value could be determined. He thought a smaller setting than the one designed by M. Rummens, which was estimated to cost 30,000 frs., would be sufficient for a preliminary test; and the amount allocated would then be enough. Such a setting would be adequate to show the quality of the gas produced. M. Rummens said his impression was that the 10,000 frs. was intended as a contribution towards the expense of erecting a trial setting in accordance with the plans which he had exhibited; and this view of the position was subsequently confirmed by the Burgomaster of St. Gilles.

THE EXHAUSTING AND COMPRESSING PLANT AT THE GENNEVILLIERS GAS-WORKS.

In a recent issue of the "JOURNAL" (*ante*, p. 87), we gave an account of the distributing plant laid down by the Société d'Eclairage, Chauffage, et Force Motrice for the supply of gas in the suburbs of Paris from their new works at Gennevilliers. It may be remembered that in addition to these works there are two gasholder stations—one at Boulogne-sur-Seine and the other at Alfortville—to which gas is conveyed by three mains ranging from 39 inches down to 20 inches in diameter. From the largest of



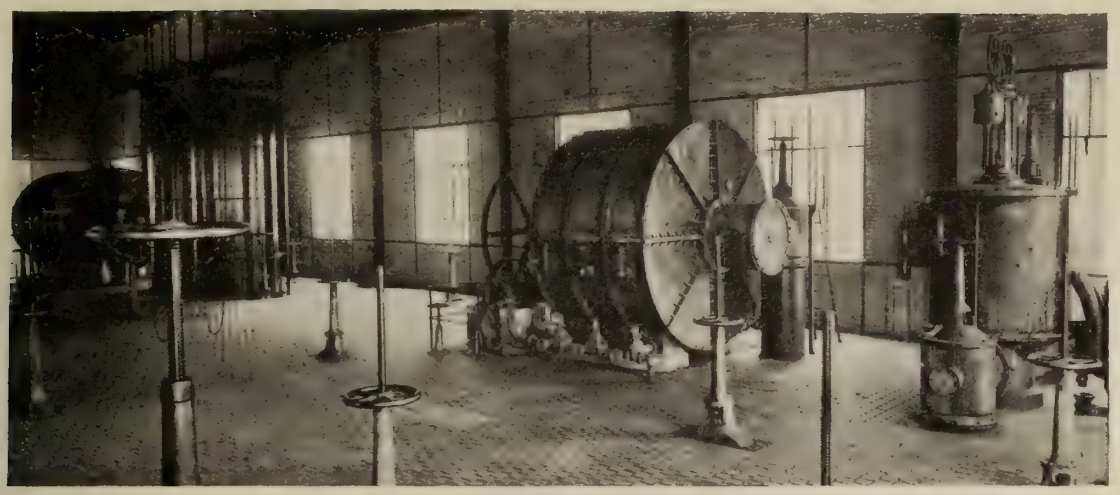
The Exhauster-Room.



The Governor-Room.



The Compressing-Plant.



Battery Condensers, Naphthalene Washers, Tubular Condensers, and Ammonia Washers.

these mains are taken the branches for the supply of the several communes; and at the junctions are placed the necessary governors for regulating the pressure. We to-day give a few particulars and illustrations of the exhausting and compressing plant.

The gas is sent from the principal works by three sets of two double exhausters (one kept as a stand-by), each driven by a steam-engine placed between them. The gas is drawn off the inlet-pipe to the holders at Gennevilliers in such a way that the variations of pressure do not cause repercussion on the distribution, and is carried forward by the smaller mains direct to the storage stations. The compressing plant includes a double-action relief regulator for diverting the current of gas in the scarcely probable event of the gasholders at Gennevilliers being right down, or the inlet-valves of those at Boulogne and Alfortville being closed by inadvertence. The latter holders can also be filled from the larger main; and with the view of avoiding too great a lowering of the pressure, there has been erected at each of the two stations named one of Beale's exhausters driven by a gas-engine furnished with an anti-fluctuator. It only remains to mention that the installation of the whole of the appliances just described was entrusted to the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz of Paris, to whom we are indebted for the loan of the photographs from which our illustrations were prepared.

INVESTIGATIONS OF LIGHT-STANDARDS.

By Clifford C. Paterson.

Extracts from a Paper read before the Institution of Electrical Engineers last Thursday.

In the introductory lines of the paper, the author reminded the members that four years have elapsed since Dr. Fleming raised the question of photometry before the Institution, in a comprehensive paper on electric lamps. The communication dealt in a very thorough way with the general position of light standards in 1902; and Dr. Fleming pointed out the uncertainty which existed in photometric comparisons at the time, due in no small degree to the difficulty of reproducing light standards accurately, and also to uncertainties which existed as to their relative values. The object of the author in the present paper was to lay before the Institution, first of all the results of some investigations on flame standards made at the National Physical Laboratory, and afterwards to describe other tests, some of which were carried out on carbon filament lamps for the Engineering Standards Committee. [The extracts given here are confined to the former section of the paper.] The author expressed the hope that the data would be of value to the electrical and gas industries. The following portions of the paper are in the author's own words.

Comparison of Flame Standards.

The investigations referred to were undertaken two years ago at the instigation of the Institution of Gas Engineers, with the object of determining the ratio between the candle powers of the three principal standards as used by the gas industries at the present time in France, Germany, and Great Britain. The author desires to acknowledge the kindness of the Institution of Gas Engineers in allowing the publication, in this paper, of the main features of the report submitted to them eighteen months ago, and which they have only refrained from publishing earlier at the request of the International Photometric Commission.

This Commission, on which the Institution of Gas Engineers is represented, arranged for similar tests to be made in France and Germany, in order to obtain a set of independent comparisons which shall enable the ratios between these standards to be defined with more certainty and greater accuracy than at present. The results of tests in France and Germany, although completed more recently, have already been published; and a comparison of the figures is exceedingly interesting as showing the order of agreement which has been obtainable in the photometric measurements made by separate observers working under different conditions with different apparatus. A detailed comparison of the methods adopted in carrying out the tests cannot usefully be made until the full report of the Commission has been published; but the results of the tests in the various laboratories are tabulated and compared at the close of this section of the paper. The standards to which reference has been made are respectively the Carcel, the Hefner, and the 10-candle power Harcourt pentane lamps. In all measurements which are described here, special care has been taken in the manipulation of the lamps so as to conform to the regulations and practice observed in the countries in which they are the recognized standards.

Influence of Atmospheric Conditions.

It is now generally appreciated that atmospheric conditions have important influence on the candle power of flame standards. Dr. Liebenthal, at the Reichsanstalt, was the first to make quantitative measurements, in order to determine the amount of their influence on the candle power of lamps. He investigated two standards, the Hefner lamp and the Woodhouse and Rawson 1-candle pentane lamp, and the formulæ which he found for correcting the Hefner lamp are now generally accepted.

In a photometer room, the principal variations to which air is liable are the following: (1) Variation in the amount of carbon dioxide; (2) variation in the amount of water vapour; (3) variation in the proportion of oxygen and nitrogen; (4) changes in barometric pressure. Before any measurements with flame standards can be considered reliable, it must be ascertained that the air is under standard atmospheric conditions, at least as regards 2, 3, and 4. If the conditions be abnormal, the amount of water vapour in the air as well as the barometric pressure must be known.

In making measurements to determine the amount of candle-power variation due to any one of the above atmospheric changes, it is very difficult to artificially increase or decrease one without at the same time varying the others; and though attempts were made by the author to vary artificially the amounts of carbon dioxide and water vapour in the air, the results were difficult to interpret. The method was, therefore, discontinued in favour of the plan of waiting till the weather changed, and the desired conditions came in the ordinary course of events.

As these experiments must, in the nature of things, cover a considerable time, more extended investigations have been made by the author on the Harcourt 10-candle pentane lamp. This is the standard of the Metropolitan Gas Referees, and has been adopted at the National Physical Laboratory as being the most convenient unit of light; and the standard whose value is now most generally recognized as representing that of ten British parliamentary candles.

Carbon Dioxide.—In order to determine the effect, if any, of variations in the amount of carbon dioxide present in the air, samples of air were taken from the neighbourhood of the lamps while observations were being made. The air was slowly drawn into previously exhausted 10-litre vessels, which, when full, were tightly stoppered and examined at the end of the observations. The amount of carbon dioxide was determined by shaking up with barium hydrate and subsequent titration with oxalic acid. It was found that the normal variation of carbon dioxide in the air at Bushy House only covered a range of from 0·3 to 0·7 part

TABLE I.

Column 1. Hours after Lighting up.	Column 2. Candle Power of Pentane Lamp.	Column 3. CO_2 in Litres per Cubic Metre.	Column 4. Water Vapour in Litres per Cubic Metre of Pure Air.
0	10·06	0·55	9·0
¾	9·75	0·9	10 6
1¾	9·60	1·4	11·0
3½	9·45	1·8	11·8
4¼	9·33	1·9	12·2

per thousand; and no candle-power difference was observable due to this amount of change. In order to increase the effect, the amount of carbon dioxide was artificially increased to 1·9 litres per thousand—the photometer room being closed, and candle-power readings taken over four hours. The results of such an experiment are given in Table I. After correcting for the increase of humidity, the decrease in candle power after 4¼ hours amounts to some 5 per cent., which is very little in excess of the observed decrease when the lamp is merely left burning in an ordinary closed room.

Dr. Liebenthal found, from experiments in which he artificially increased the amount of carbon dioxide to 14 litres per cubic metre, that the candle power of the Hefner lamp varied 0·7 per cent. for an increase of 1 litre per cubic metre. As the amount of carbon dioxide in a closed room, 5 × 6½ × 4 metres, in which the lamp has been burning for upwards of one hour, only varies from about 0·5 to 0·8 litre per thousand, the influence of carbon dioxide on the candle power of flame standards may be considered, for practical purposes, as negligible.

Water Vapour.—The amount of water vapour in the air is the most disturbing factor to be considered in dealing with flame standards, as it cannot be remedied by ventilation of the photometer room. There are large natural variations in humidity throughout the year, and rapid changes from day to day. For instance, the total variation in the candle power of the pentane lamp between a warm, damp day in summer and a frosty one in winter, may amount to 10 per cent.; and between two consecutive days, it is frequently 2 or 3 per cent.—the changes in the Hefner lamp from this cause being very little less than in the pentane.

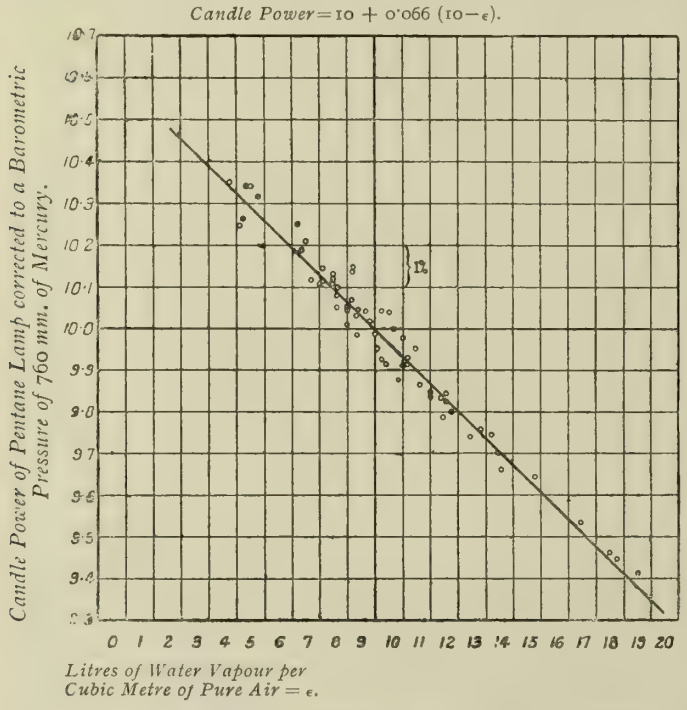


Fig. 1.—10-Candle Harcourt Pentane Lamp—Variation of Candle Power due to Humidity.

A discussion of the various methods of measuring humidity is a subject which hardly comes within the scope of this paper. The chemical method, Dynes' dew-point hygrometer, the ordinary wet and dry bulbs, and the Assmann ventilated wet and dry bulb thermometers have all been used. The last-mentioned instrument has been found to give the most reliable and consistent readings, as well as being the easiest to manipulate. The author reproduces a curve which he published in his paper read before the British Association in 1904*, showing the effect of variations in the humidity of the atmosphere on the candle power of the pentane lamp; the candle power being plotted vertically, and humidity horizontally. The latter, for obvious reasons, is stated volumetrically, and is expressed as the number of litres of water vapour per cubic metre of dry air. If, therefore, e stands for the aqueous pressure, then the water vapour per cubic metre of pure air

$$= \frac{e}{b - e} \times 1000 \text{ litres},$$

where b is the reading of the barometer. Each point on the curve is the mean of a set of observations. None of the atmospheric conditions were artificially produced; but the results were obtained by observations taken under normal conditions throughout the year. These show, therefore, the kind of candle-power variations which may be expected when using the lamp under favourable conditions—amounting to a possible error, due to humidity alone, of *plus* or *minus* 5 per cent.

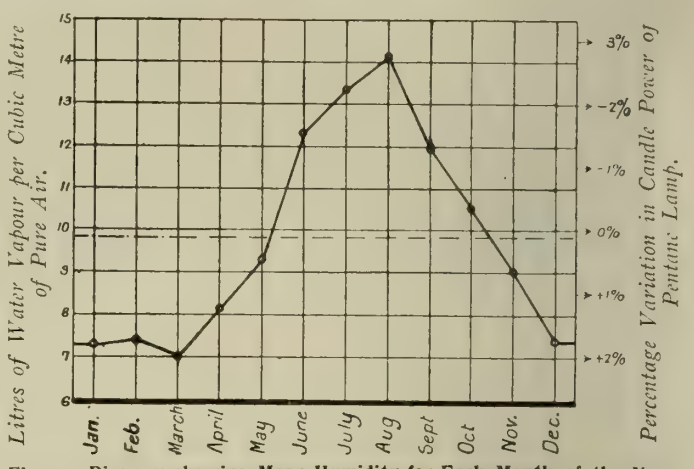


Fig. 2.—Diagram showing Mean Humidity for Each Month of the Year.

The curve has been obtained from the barometer and humidity readings by the method of least squares. On the assumption that the variations follow straight-line laws, the following formula is obtained, connecting candle power and humidity for the 10-candle lamp:—

$$\text{Candle power} = 10 - 0{\cdot}066\ (10 - \epsilon)$$

where ϵ is the number of litres of water vapour per cubic metre of dry air.

It will be observed from this formula that the candle power of the lamp has its standard value when the volume of water vapour is 10 litres. This figure has been taken as representing very nearly indeed the mean humidity over the three years 1897–8 and 9, both at the Meteorological Office in Victoria Street and at the Observatory Department of the National Physical Laboratory. The former gives a mean of 10·04 litres per cubic metre, and the latter 9·85 litres.

The curve in fig. 2 shows the mean humidity over three years for each month of the year as found at the Observatory. Humidities are plotted as ordinates on the left-hand side, and percentage variation in candle power on the right. It will be seen from this that the average monthly humidities range from 7 to 14, corresponding to errors of about *plus* or *minus* 2 per cent. in candle power. As already observed, however, individual observations are liable to twice this error.

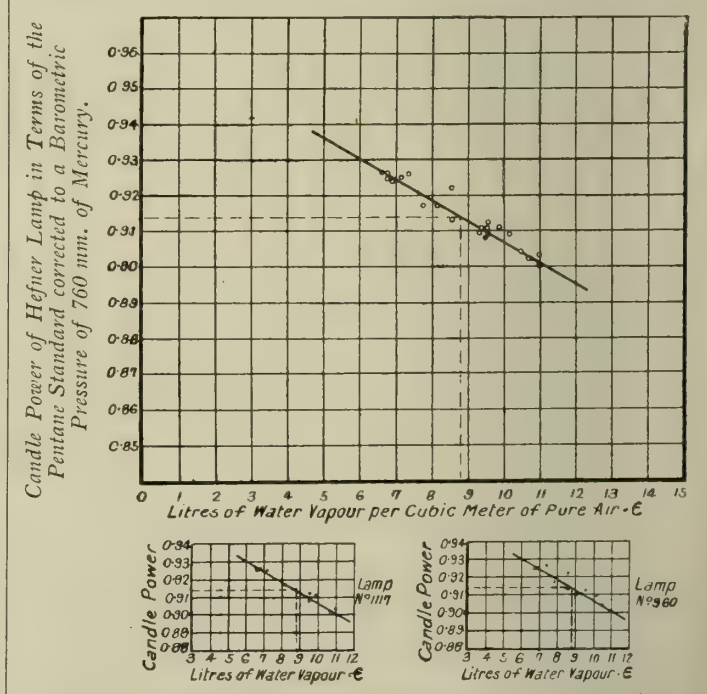


Fig. 3.—Hefner Lamp—Variation of Candle Power due to Humidity.

Fig. 3 gives a curve similar to that shown in fig. 1, but obtained for the Hefner lamp. Its candle power is expressed, for the sake of comparison, in terms of the pentane lamp burning in an atmosphere containing 10 litres of water vapour per cubic metre of pure air. Two lamps previously certified by the Reichsanstalt (the German Standards Laboratory) were used in the experiments; the observations on the individual lamps being shown separately by the side of the main diagram, in which all points

* See "JOURNAL," Vol. LXXXVII., p. 606.

have been plotted. The formula obtained from these observations is—

Candle power (pentane units) = 0·914 + 0·006 (8·8 − ϵ).

Dr. Liebenthal, from the average of a much larger number of observations made over a greater range of humidity, found a formula which, using the ratio of Hefner to pentane as 0·914, gives the following relation:—

Candle power (pentane units) = 0·914 + 0·005 (8·8 − ϵ).

As this is based on more numerous data, it should be accepted in preference to that given by the author for the Hefner lamp. It may be noted, however, that the difference between the two formulæ produces a discrepancy of under 1 per cent. in candle power even for an extreme case.

As all the observations were made in the neighbourhood of 8·8 litres of moisture (which is the humidity fixed by the Reichsanstalt at which the lamp shall be taken as giving 1 Hefner candle), the exact value of the humidity constant will not affect the accuracy of the ratio found for the candle power of the two standards.

A similar set of experiments was made with two Carcel lamps; but the want of constancy in the lamps themselves, introduced inconsistencies into the results which were of a greater order of magnitude than the largest change produced by such range of humidity as was obtainable at the time of the year. The results of the tests have been plotted in fig. 4 in order to obtain a graphical comparison with the tests on the other lamps. They show that the Carcel lamp cannot be relied upon for constancy to the same extent as the other lamps. It will be seen, however, by the diagrams on the right-hand side of the figure, that the average candle power of one Carcel lamp is in very close agreement with the average candle power of the other.

The Proportion of Oxygen and Nitrogen in the Air.—The author is not aware that any quantitative measurements have yet been made on the diminution of candle power due to a scarcity of oxygen in the photometer room. Dr. Liebenthal discusses the matter on theoretical grounds, and calculates that a decrease or increase of 1 per cent. in atmospheric oxygen should make a difference of 4 per cent. in candle power. It has been remarked by most experimenters with flame standards—especially with a large unit like the 10-candle pentane lamp—that the candle power rapidly falls off in a closed room, and that this reduction cannot be accounted for by the increase of water vapour or carbon dioxide in the air. The author has made measurements in a closed room of 130 cubic metres capacity, and finds that the candle power of the pentane lamp falls about 1 to 1½ per cent. in 1 hour.

Mr. Dow has recently published some curves* showing results of tests made at Kensington in a room of about 400 cubic metres capacity, in which, with two persons in the room and two gas-burners alight, the candle power dropped some 2·5 per cent. in 1 hour. In a small, closed photometer room in which no effort is made to ventilate, a variation of from 7 to 10 per cent. may quite possibly be obtained. With a small unit such as the Hefner lamp, the trouble due to this cause is not so great; but it may safely be said that, under no circumstances, is it safe to use a flame standard in a room which has not very efficient ventilation.

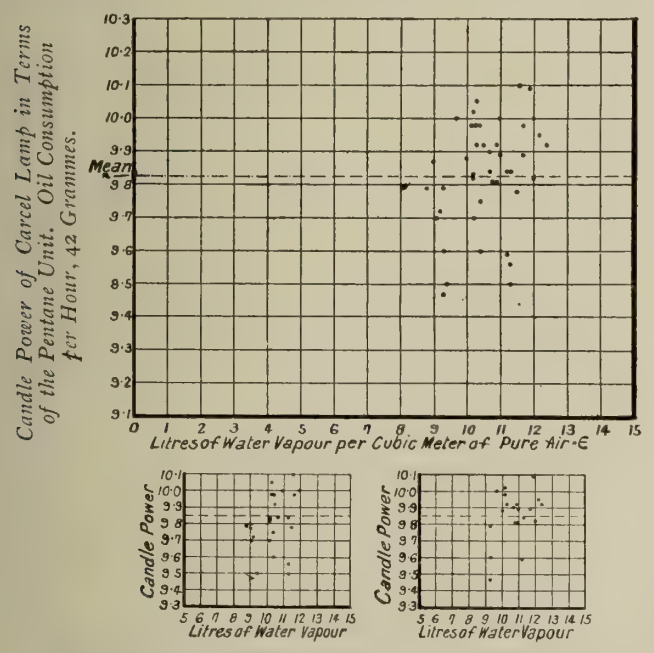


Fig. 4.—Carcel Lamp—Diagram Showing Observations made.

In the case of a 10-candle-power pentane lamp, no measurements should be relied upon which have been made after the lamp has been burning in a closed room for more than fifteen or twenty minutes, unless, of course, the source of light which is being measured is affected in the same way by atmospheric changes. The author proposes to make some tests on flame standards in the near future, measuring at the same time the amount of oxygen in the air, with the object of determining if the diminution observed in their candle power, as explained above, may be attributed to this cause. The experiments would have to be made in a small, closed room into which oxygen can be introduced in large quantities.

These facts illustrate how misleading may be the results obtained from comparisons made against a flame standard unless proper precautions are taken and the necessary corrections applied. Suppose, for instance, that the lamp is being used in a room in which the ventilation is bad, and causes (say) a drop of 1·5 per cent. in the candle power of the lamp. If the day be hot and damp, and the barometer low, the 10-candle lamp will be giving a light of the order of 9·2 candles; and the Hefner lamp under the same conditions will be only slightly more accurate.

Barometric Pressure.—Under normal conditions, the amount of variation due to this cause does not give rise to such large errors as changes in humidity. With a high barometer, the candle power tends to rise; but the amount of the increase or decrease varies considerably with the type of flame—being 0·8 per cent. per 10 mm. variation in barometric pressure for the 10-candle pentane lamp, and (according to Dr. Liebenthal) 0·1 per cent. for the same variation in the case of the Hefner unit. The author has found 0·2 per cent. in the latter case, while Dr. Liebenthal finds 0·6 per cent. in the former. The same authority has found 0·4 per cent. in the case of the 1-candle pentane flame.

The formulæ which are most probably correct for expressing candle-power variations due to barometric changes are—

Pentane lamp: Candle power = 10 − 0·008 (760 − b).
Hefner lamp: Candle power = 0·914 − 0·0001 (760 − b).
(Pentane Units.)

Photometric Methods.

The foregoing notes on the variation of standards with changing atmospheric conditions make it clear that it is not sufficient, in comparing any two flame standards of different types, to fix them up on the bench and measure the ratio of their candle powers, without regard to the state of the air, on the assumption that they will both be affected equally by it. Unless the atmospheric conditions at the time of observation happen to be standard, or very nearly standard, it will be necessary to make a series of candle power comparisons with hygrometric and barometric readings. A formula has then to be deduced from which the candle power, under standard conditions, may be found.

The method of comparing two flame standards by fixing them both on a bench together, and obtaining points of balance between them, is not to be recommended, especially when the ratio between them is of the order of 1 to 10, as it is in the case of the Hefner and pentane lamps. The method entails a change over of the lamps to opposite ends of the bench, a maximum difference of colour in the photometer, and the simultaneous regulation of the height of the two flames—which is a troublesome operation. The double comparison, or substitution method, fully described by Dr. Fleming in the paper already mentioned, is much to be preferred. By this method, a constant source of light (such as an electric lamp) is fixed at one end of the bench, and the two flame standards to be compared are alternately measured against it. In the tests described in this paper, each flame lamp was compared through the medium of an electric comparison lamp of suitable colour against the large bulb electric standards which now form the principal working standards of the Laboratory. The method has the following advantages:—

(*a*) Only one flame lamp has to be regulated at a time;
(*b*) Personal and bench errors are eliminated;
(*c*) A set of observations is obtained from which the relations between candle power and atmospheric conditions can be deduced for each lamp.

Lamps and Criticism.

The Ten-Candle Harcourt Pentane Lamp.—Having briefly described this lamp, the author remarked that, as far as he is aware, the extent to which a variation in the dimension of any part of the lamp affects its candle power has not yet been determined. Some points in the lamp are, of course, much more sensitive than others; and the author has on hand at the present time a set of experiments on a special lamp, by which it is hoped to ascertain the most important points in its construction, and the amount to which a given increase or decrease of the dimension of any part will affect the candle power.

The Metropolitan Gas Referees state in their notification that in regulating the height of the flame to about midway between the bottom of the window and the bar which crosses it, a variation of a quarter of an inch either way does not materially affect the candle power of the standard. This statement may be accepted, provided the accuracy required is not greater than about 1 per cent. If, however, measurements are to be within this limit of accuracy, it is essential that the flame shall be kept at the right height. Dr. Liebenthal finds that the flame may rise above the mark, but not fall below it. The author's experiments, however, confirm those of other observers, in showing that Mr. Harcourt has so proportioned the dimensions of the lamp that, when the flame is at its correct height, its candle power is a maximum—any variation above or below the normal height causing a decrease in candle power. This is a point which is greatly in favour of the lamp, as it means that a certain variation of height is possible, within

* See "Journal," Vol. XCVI., p. 20.

which it is quite easy to regulate the flame, and within which the candle power does not perceptibly vary. By affixing a piece of rubber tube to the air-inlet cock on the saturator, and regulating the flow of air through it by an ordinary screw clip, a most sensitive means of flame adjustment is obtained. The observer also is able to stand at such a distance from the lamp that he will not disturb the steadiness of the flame through air currents set up by breathing near it. From this point of view, the lamp compares favourably with the Hefner standard, the flame adjustment of which, in spite of the ingenious optical device used, is a matter requiring great patience and entailing some uncertainty.

The procedure which the author has found it desirable to adopt when using the standard is as follows: The lamp is set up plumb at the end of the bench by means of a plumb-line passed through the chimney, and made to coincide with its central axis by means of a centring plug at the top. The lamp is then levelled till the plumb-bob hangs exactly over the middle of the burner. A gauge of the same pattern as that employed by the Gas Referees is then used to measure the distance of the lamp from the photometer. It has a pin at one end which exactly fits the centre of the burner, and a shoe at the other end, the tip of which must graze some known point on the photometer (either the screen or some portion of the box which is a definite distance from it). The lamp is lighted up and all doors and windows of the room are thrown open. The lamp is allowed to burn this way with free circulation of air for half an hour. The electric comparison lamp is then brought up to its correct voltage by the potentiometer, and all windows and doors closed before taking readings.

The author has not as yet found any photometer which, for the same coloured light, is equal in sensitiveness and accuracy to the Lummer-Brodhun contrast apparatus, which was used in all the experiments described in the paper. Some twelve or fourteen readings are made during the first ten minutes after the room has been closed, together with observations on both ventilated and unventilated hygrometers placed at different points in the neighbourhood of the lamp. It is desirable for one of the observers to remain at the photometer and on no account to see the position of his own settings, while another adjusts the flame and takes down readings.

As regards the accuracy of photometric observations made under these conditions, much depends upon the condition of sensitiveness of the observer's eye on any particular occasion. This is certainly a variable quantity. The author has found on some occasions that ten readings will agree among themselves to within *plus* or *minus* a quarter of 1 per cent.; while on others the extremes are occasionally as much as *plus* or *minus* 1 per cent. A set of ten observations taken at random from a test-book shows the following values for the pentane lamp in terms of the National Physical Laboratory Standard Electric Lamps, and illustrates the kind of individual variations to be looked for in such measurements:—

$9{\cdot}81_5$, $9{\cdot}81_5$, $9{\cdot}87_6$, 9·90, 9·90, 9·85, $9{\cdot}87_8$, $9{\cdot}87_8$, 9·85, $9{\cdot}83_8$, $9{\cdot}86_7$.

The humidity on this occasion was 12·4, and the barometric pressure 762 mm.

The Hefner Lamp.—Having described this lamp, the author stated that the general precautions to be observed as regards ventilation when using the lamp are the same as for the pentane standard, except that the room may be closed somewhat longer while readings are in progress before the candle power of the lamp shows signs of diminution. Considerable care and skill must be employed in judging whether the flame is at its correct height. The author has observed a tendency for the flame to vary its shape from one which is high and pointed, to one which is somewhat depressed and flattened at the top, and an error in candle power may result from taking either of these as correct, and adjusting either the pointed or the flattened flame to the level of the cross line.

The Carcel Lamp.—This lamp was described; and in further references the author said he has found that, after taking a large number of observations, and using the utmost care in all the adjustments, he has been unable to make readings from the lamp agree with certainty to within an accuracy of + or − 3 per cent. In any two directions at right angles, the light from the flame may vary by as much as 2 per cent.; and to ensure even the 3 per cent. limit of accuracy, it is generally necessary to take a mean of four readings round the flame in directions at right angles to each other in a horizontal plane.

Summary of Results.

In summarizing the results of the tests described, and comparing them with those made in laboratories on the Continent, it is essential to take into consideration the fact that the Hefner lamp in Germany has its standard value when the volume of water vapour is 8·8 litres per 1000 litres of air; whereas both the pentane and Carcel lamps are taken as having their nominal value when the humidity is 10 litres per 1000.

The following values are obtained for the Hefner and Carcel lamps from the curves given in figs. 1, 3, and 4. These values are in the terms of the 10-candle Harcourt pentane lamp. In the case of the Carcel standard, the mean of all the readings shown in fig. 4 has been taken. The variations of the Carcel lamp with changing humidity will hardly concern these figures, since all measurements were made in the neighbourhood of 10 litres per 1000.

Hefner lamp = 0·914 pentane units.
Carcel lamp = 0·982 pentane units.

The following tables give the values for the same ratio recently obtained and published by the Reichsanstalt in Berlin, and by the Laboratoire Centrale d'Electricité and the Laboratoire d'Essais et Conservatoire in Paris.*

Expressing the values of all the units in terms of that given by the pentane lamp, we have—

	Pentane.	Hefner.	Carcel.
National Physical Laboratory	1	0·914	0·982
Reichsanstalt	1	0·917	0·991
Laboratoire Centrale	1	0 929	1·000
Laboratoire d'Essais	1	0·928	0·996

Expressed in terms of the unit given by the Hefner lamp they are as follows—

	Pentane.	Hefner.	Carcel.
National Physical Laboratory	1·094	1	1·074
Reichsanstalt	1·090	1	1 080
Laboratoire Centrale	1·076	1	1·076
Laboratoire d'Essais	1·077	1	1·067

Expressed in terms of the unit given by the Carcel lamp—

	Pentane.	Hefner.	Carcel.
National Physical Laboratory	1·018	0·931	1
Reichsanstalt	1·009	0·926	1
Laboratoire Centrale	1·000	0·929	1
Laboratoire d'Essais	1·004	0·937	1

These results show that, in entirely independent comparisons of flame standards in Paris, Berlin, and London, the maximum difference between London and Berlin was 1 per cent.; between Paris and Berlin 1·7 per cent.; and between London and Paris 2·1 per cent. It should further be remarked that the discrepancies may to some extent be accounted for, leaving a smaller residual error to be attributed to unexplained causes.

Comparison and Criticism of the Three Lamps as Standards of Light.

The measurements made at the National Physical Laboratory on the three principal flame standards now in use have given opportunities for comparing them under working conditions and judging of their respective suitability as standards of light.

As regards the Carcel lamp, it has not been found that its constancy from day to day is comparable with that of either the Hefner or pentane lamp; its variations from the mean being as much as + or − 3 per cent. The reason for this can only be attributed to the difficulty in reproducing the same conditions of capillarity in the wicks used. Although all possible care was taken to produce the most favourable conditions of constancy, the results were not satisfactory, and in the notes which follow, the pentane and Hefner lamps only are considered with reference to their suitability as light standards.

General Construction.—The Hefner lamp, which is only one-eleventh the candle power of the pentane lamp, is much simpler in general construction, small and more easily set up, and should be simpler to manufacture and adjust to standard dimensions.

Ease of Regulation and Working.—It has been found in using the lamp that the flame of the 10-candle pentane standard is a great deal easier to adjust, and remains more constant while observations are being made than the amyl-acetate lamp.

The fact that the Hefner unit has a lambent flame, burning in free air, whereas the pentane standard is well shielded and, owing to its chimney, has a more stable flame, makes the latter practically independent of draughts which would render measurements with the Hefner lamp quite impossible. Although the flame of the Hefner lamp may be shielded, slight movements of the air cannot be avoided. These disturb the flame so that it only remains at its correct height for a few seconds—rendering adjustment difficult and the taking of candle-power readings rather a tiring process. On the other hand, it is not safe to assume that, owing to the fact that the top of the flame of the pentane lamp is cut off, the latter may be allowed to vary appreciably in height. Variations of 3 mm. up or down do not materially affect the candle power, but for accurate work a second observer is required in order to see that the top of the flame is flat, and to regulate it to the correct height.

Effect of Atmospheric Changes.—As regards changing humidity, the two standards are affected to nearly the same extent; the Hefner lamp being slightly less influenced than the pentane lamp. The latter standard, however, is very much more sensitive to barometric variations than the Hefner unit—a 1-inch change in pressure being equivalent to 2 per cent. in candle power.

Nature of the Light.—The pentane lamp has a whiter light than the Hefner unit, being much more nearly the same tint as the Carcel standard. The fact that its candle power is eleven times that of the amyl-acetate lamp makes it of the same order of magnitude as the ordinary lights which are tested against it. These two factors, coupled with the greater ease of adjustment when making observations with the pentane lamp, greatly outweigh, in the author's opinion, the disadvantage of the more complicated construction and the larger correction that has to be applied for changes in barometric pressure.

* The values for the three ratios given by the Laboratoire d'Essais differ among themselves by about 1 per cent. The mean values have therefore been taken.

Secondary Standards of Light.

Under this section the author gives the results of tests made at the National Physical Laboratory on a number of high-voltage standard electric lamps. The tests were undertaken to ascertain what order of constancy may be expected from the best high-voltage glow-lamps, with a view to using them as photometric standards. The first point which is evident from an inspection of the curves presented by the author is, that the performance of filaments specially prepared for constancy cannot be predicted with certainty. If a lamp is to be used as a photometric standard of the first grade, its history for 100 to 200 hours should be known, and its life curve should be closely watched in order to ascertain the point at which it is beginning to flatten out. If the only photometric standards required were of the low-voltage type, the problem might be considered as solved. A properly aged specially prepared low-voltage filament if burnt for (say) ten minutes a day for five days a week should last two or three years without changing the half of 1 per cent. in candle power, provided that no excess voltage is applied. Where, however, the only source of supply is a high-voltage variable circuit, it is essential that the standard and the test lamp shall be run in parallel, so that the effect of voltage variations may be reduced to a minimum. This entails either the use of a low-voltage lamp with a fixed resistance in series, or a high-voltage lamp of reasonable constancy.

In the tests under consideration six lamp makers kindly undertook to co-operate with the laboratory in the investigations, by supplying high-voltage 16-candle-power lamps, with filaments which they considered would be most suitable for standard purposes. The filaments were in one plane and the bulbs of ample dimensions. The lamps numbered in all thirty-seven, and were run on a pressure-regulated circuit with frequent observations of candle power and current.

The average rate of fall in candle power for each make of lamp is given in Table II., as well as its average efficiency. The figures in the fourth column are taken from the portion of the curve at which the rate of fall is most even.

Table II.

Make of Lamp.	Number Tested.	Average Initial Watts per Candle.	Column 4. Percentage Fall in Candle Power per 100 Hours.
A	5	3·4	4·6
B	4	4·2	0·9
C	3	4·1	1·7
D	8	4·0	3·7
E	11	4·5	2·9
F	6	3·7	3·5

As a result of these investigations, there is no doubt that high-voltage lamps are to be obtained which remain constant for a considerable time. They cannot, however, as yet be produced with certainty. By trying a number of special lamps, some may be found which are in every way as good as low-voltage standards; but at present the only alternative to this is to select a lamp with as small and as regular a drop as possible, and rely on restandardization after about twenty hours' running. It should not be necessary to run a standard under ordinary conditions for longer than forty-five minutes per week in all. In this case restandardization would only be required every six months.

Commercial Glow-Lamp Testing.

In the next section of the paper, which was of considerable length, the author emphasized the need for a closer supervision of the electric glow lamps which in the ordinary course of business are supplied to purchasers in this country. Lamps which are otherwise good are classed for use on voltages for which they are unsuited, and either give out early or have a long and inefficient life. On the other hand, many lamps are sold which, although of average efficiency, drop within a comparatively short time to 80 per cent. of their original candle power. It is noteworthy that although the greatest effort is often made to obtain the last ½ per cent. efficiency in the machinery generating the lighting current, often under severe penalties to the maker, an inefficiency of 20 per cent. or more in the glow lamp (the last link of transformation) is allowed to pass altogether unheeded and unchecked. It is surely in the best interests of the supply companies that the consumer should get the best value for his money. In the specification of the Sub-Committee on Physical Standards of the Engineering Standards Committee, published this winter,* rules are laid down for the inspection and testing of samples from consignments of glow lamps with the object of determining whether the delivery from which they were taken comes up to the specification.

The Engineering Standards Committee have given the author permission to publish the results of some tests which have been carried out for them at the National Physical Laboratory on 120 high-voltage glow lamps. These were made by ten British makers, and were bought over the counter in the ordinary way. The extreme values of candle power, watts per candle, and life for each batch are given in Table III. It must be admitted that these wide variations leave much to be desired.

* See "Electric Lighting Memoranda" last week, p. 205.

Table III.

Make of Lamp.	Mean Horizontal Candle Power (Extreme Values).	Watts per Candle Power (Extreme Values).	Probable Life.
Batch			Hours.
1	16·1 to 21·5	3·04 to 3·75	43 to 130
2	13·1 to 14·8	3·83 to 4·19	340 to 650
3	15·2 to 17·8	3·56 to 3·90	330 to 660
4	14·1 to 17·0	3·72 to 4·26	470 to 1040
5	12·9 to 20·4	3·15 to 5·02	76 to 1170
6	12·1 to 18·4	3·29 to 4·65	136 to 1120
7	11·0 to 18·2	3·44 to 5·21	230 to 2500
8	15·3 to 19·4	3·12 to 3·76	180 to 540
9	13·0 to 16·1	3·33 to 4·25	190 to 790
10	13·1 to 18·6	3·24 to 4·28	160 to 820

It is rightly urged in extenuation of this condition of things, that the very unequal grading of supply voltages in this country renders it impossible for makers to supply lamps at a reasonable price which shall fall within the same narrow limits that are imposed under the American system. It is not possible in lamp manufacture to predict, even within fairly wide limits, what will be the voltage at which a lamp will give a certain candle power and consume a specified number of watts per candle. There must, therefore, of necessity be a considerable number of lamps which would be more suitable for, say, 215, and others for 225 volts, which are, nevertheless, rated for 220 volts, because of the small demand for lamps for the odd pressures, and the natural desire to keep down the number of outfalls to a minimum. But even taking this into consideration, the fact that some of the English makers are able to turn out a much more uniform product than others, shows that improvement would be possible if the large buyers of lamps insisted on having them supplied to specification, and took proper steps to see that they did not fall short of the guarantees.

Regarding the life test of individual lamps, the useful life obtained from the different groups varied between the limits of 150 and 550 hours.

If there are enough lamps to choose from, it may be possible to find some which have their standard efficiency at the marked voltage; but it must be remembered that great accuracy is required in the watts per candle, as 1 per cent. above or below the mean will cause a 5 per cent. error in the life.

Towards the close of the paper the author referred to the vital importance of good voltage regulation.

The Importance of Accuracy.

In conclusion, the author wishes to emphasize the importance both of accurate photometry and accurate electrical adjustments in connection with the rating and testing of glow lamps. The specification recently issued by the Engineering Standards Committee provides a sound basis upon which glow lamps may be bought and tested; but it is essential, in view of the sensitiveness of the glow lamp to small changes in pressure, that all measurements under it shall be conducted with a maximum degree of accuracy.

The waste of money per annum in this country due to using unsuitable lamps must be very great; and the only way to stop the waste is to encourage those manufacturers who rate their lamps properly and who give an effective guarantee of their quality. It should further be noted that, in order to obtain all the advantages accruing from the accurate rating of glow lamps, it is essential that supply engineers should regulate the voltage at the consumers' terminals within the narrowest possible limits.

In connection with these tests, the author specially acknowledges the obligation he is under to Dr. Glazebrook, Director of the National Physical Laboratory, and to other members of the laboratory staff for counsel and help.

Points from the Discussion.

The President (Dr. R. T. Glazebrook, Director of the National Physical Laboratory) said he thought the members were all very grateful to Mr. Paterson for the admirable manner in which he had put the paper before them. The author had alluded to the earlier work of Dr. Fleming; and he was glad they had him with them that evening. Perhaps he would open the discussion.

Dr. J. A. Fleming (London) remarked that Mr. Paterson had placed the members under great obligation by bringing before them the results of these long and careful tests at the National Physical Laboratory. Nowhere else could such a series of tests have been carried out. In any laboratory where the principal work was either commercial or consultative, it would be impossible to carry out such work as Mr. Paterson had described. He had given them an exceedingly full and valuable account of the behaviour of flame standards; and he had heaped proof upon proof that some of the statements were true that he (Dr. Fleming) made four years ago as to the variability of flame standards, and the immense effect exercised upon their light by moisture, carbonic acid, and especially by want of ventilation in the room where they were used. The results that Mr. Paterson had brought before them explained many of the difficulties that were found some time back in electric lamp photometry. Of course, the gas people had never discovered these vagaries of the flame standards, because they were simply engaged in testing one flame standard against another flame; and therefore they did not learn what

was going on with one or the other. He had noticed in going into photometer-rooms, the want of ventilation in them. Electric lamp photometry, however, had fostered attention to the behaviour of the flame standards; and that gas photometry never did. One thing that had not been fully explained was the variation that was caused in flame standards by a number of persons being in a photometer-room. It was not to be accounted for by an excess of moisture or carbonic acid. He had known, in a small photometer gallery, if three or four persons were present, there would be a marked variation in the flame standard; but, when the room was ventilated, the light of the flame standard would be restored. It was on account of these difficulties that he went into the question of the use of large bulb secondary standards. He found that the decay in the candle power of the lamp was largely, if not altogether, due to the deposit of carbon upon the glass. It therefore stood to reason that the larger they could have the glass, the less would be the obscuration in a given time of usage. He believed the large bulb standard on that account—provided it could be properly aged to begin with—would give them a less variable standard than would be afforded by a flame lamp subject to variations of atmospherical conditions. Regarding the ratio between the Hefner unit and the pentane unit, the author had given it as 0·914. He (Dr. Fleming) had sent three large bulb lamps to the Reichsanstalt in Berlin, to be tested. On their return, they were forwarded to the National Physical Laboratory and tested by the pentane standard. The ratios of the National Physical Laboratory to the Berlin measurement, given in Hefner units, was 0·888, 0·882, 0·885. This was very close, and showed that the ratio of the candle power of the lamps was practically the same. He had not been able to ascertain the reason for this; but perhaps Mr. Paterson could explain. If they took the Berlin measurements, in Hefner units, and reduced them to pentane units, they would find a difference of about 3 per cent. between the Berlin and the pentane measurements.

Mr. C. J. Robertson (London) said, in view of the unreliability of flame standards, he thought that, in the carbon glow lamps as recommended by Dr. Fleming, manufacturers of such lamps had the means of obtaining accuracy in testing to such a point that it would be ridiculous for them to trouble to go further. One of the lessons of the tests was as to the great advantage that would accrue if the filaments could be put into larger bulbs for general use. There was great competition not only in the price of carbon filament lamps, but in their quality. The fact remained, however, that, so long as circuits were so very variable, lamp specifications would not do any more good than to give more uniform lamps. Before a lamp specification could be of any great value, there should be a specification of pressures. [Laughter.]

Mr. Alex. Russell thought the tests in the paper showed that the Carcel lamp was a very good one, considering the period at which it was invented. It was invented before Murdoch's candle [Laughter], and was practically the same as the Harcourt pentane standard. Mr. Paterson in his paper dwelt upon the importance of measuring the mean spherical candle power of glow lamps. It had been admitted for many years that the method of measuring mean horizontal candle power was both unscientific and inequitable.

Mr. Lancelot W. Wild (London) referred to the large amount of work that was represented in the paper. With regard to the pentane lamp, Mr. Paterson had determined the effect of humidity and of carbonic acid upon the flame; and he had now promised to look into the question of the effect of the amount of oxygen in the air. He (Mr. Wild) would suggest that he should also look into the effect of the dimensions of the photometer-room, more especially the height. He believed the height of the room had a material effect upon the chimney draft. In preparing some tests which he had carried out with considerable care, and which were checked by Mr. Paterson at the National Physical Laboratory, he found that his pentane lamp, after all allowances had been made, gave 4½ per cent. less candle power than the one at Teddington. He put this down to the fact that his photometer-room was not so lofty as that at the National Physical Laboratory, or else that there was less oxygen in the air at Westminster than at Bushey Park. [Laughter.]

Mr. H. T. Harrison (London) considered the paper had put another nail in the coffin of flame standards. In the printed copy of the paper, it took nineteen pages to show the troubles of flame standards; and, at the end, one came to the conclusion that they could only be used by a person who had everything at his fingers' ends that was necessary to keep the standards in a right condition. It practically came to this, that one could hardly breathe in a photometer-room without affecting the flame standard in some way or other. The recent paper on metallic filament lamps by Mr. James Swinburne gave them a little more hope, because the fact that metals could be used for lamp filaments would probably result in a standard of light which would be definite, and which could be worked under conditions that would result in a standard candle power. For instance, there was platinum. Mr. Swinburne said that chemists had been able to prove it was a ductile metal. They could draw the wire to a given length, section, and resistance; and, with a given current, it would afford a given light. In a short time now, he hoped they would be able to define a standard of light which was produced by passing a given current through a specific metal of given length and of given area.

The further discussion of the paper was adjourned.

SCOTTISH JUNIOR GAS ASSOCIATION.

The Western District Section at the Bonnyside Fire-Brick Works.

On Saturday afternoon, the members of the Western District Section of the Scottish Junior Gas Association paid a visit to the fire-brick works at Bonnybridge, belonging to Messrs. James Dougall and Sons, Limited. The party, numbering fifty, arrived at half-past two, and were received by Mr. J. Dougall and Mr. E. M. Stewart, the Manager, and others. Having been divided into groups, they were conducted by Mr. A. M'Neil (the Underground Manager), Mr. T. Wishart, Mr. R. Finlayson, Mr. T. Black, Mr. J. Stewart, and Mr. J. Cochran, round the works, which are very extensive, and down into the pit from which the clay is obtained. The work of making the many-sized and many-shaped brick pieces was shown in operation; and the working of the kilns was explained. There are numerous up and down draught kilns; and a large square kiln, of fourteen chambers, which is fired by gas, made in a couple of producers, and is worked as a continuous kiln, the heat given off by a chamber in process of cooling being employed to heat the air before its admixture with the gas below the combustion chamber. The Company have recently started the making of gas-retorts, and these were seen in various stages of manufacture. The clayfield extends to 500 acres, and contains a seam of clay—ganister and black clay—of great thickness. On arriving at the bottom of the shaft, the party had a walk of some 600 yards, through a spacious gallery, from 15 to 18 feet in height, to the working face, where the men were getting the clay. It is obtained by blasting; and the proprietors did not omit the dramatic effect, at the closing scene of the inspection, of firing one or two shots, which had the startling result, apart from the detonation, of blowing out about half of the lamps carried by the party. On returning to the surface, the visitors were entertained by the Company at dinner.

The Rev. Dr. Russell, of Edinburgh, the Chairman of the Company, presided, and extended a cordial welcome to the Association. He said he was glad to know that the members desired to improve themselves and each other. They had many means by which they could do this; and there was much reason for their doing so, because he thought there was something still to be found out with reference to gas—the best mode of making it, the best kinds of materials to use, and the best way of illuminating houses, and especially large cities. He was quite surprised to learn from their President that in Glasgow alone there were 14,000 persons connected with the lighting of that great city. This showed them the immense importance of the work with which they were connected; and the more intelligently they went about their work (he was speaking particularly to the younger members), and the more they informed themselves with reference to the best way of doing it—he might say, the best way of gaining a name for themselves, and some day getting to the top of the tree, not only in being engaged in gas manufacture, but in being gas managers themselves—the better it would be for them.

The President (Mr. J. M'Leod, of Provan) proposed a very hearty vote of thanks to Dr. Russell for presiding.

Mr. E. M. Stewart, the Manager of the Bonnyside Works, read a paper, of which the following is an abstract, on

FIRE-BRICKS AND RETORTS.

The author said the subject was one of such wide scope and variety of detail that it was most difficult to condense even the details of a few aspects within the compass of the time allotted to him. He had, therefore, endeavoured to treat the whole subject from the standpoint of the gas manager, who entered the market to purchase refractory goods, and who desired some knowledge as to the conditions under which his goods were manufactured. The desirability of an intimate knowledge of the properties and characteristics of different classes of bricks was being recognized more and more in the gas profession, as no matter how complete a gas-works might otherwise be, unless the retorts and retort-settings were of the best description, both as to design, construction, and quality of materials, the result would be disappointing. A great improvement, however, had taken place in this respect within recent years; the gas manager now depending more on his own personal observation than formerly. That the industry was one worthy of consideration by all classes was apparent from the fact that in the year 1900 the output of fire-clay in Scotland amounted to upwards of 700,000 tons; in 1904 it had increased to nearly 1,000,000 tons; and, he believed, during the past year, it had exceeded that quantity.

Geologically, the deposits of fire-clay belonged to the carboniferous, cretaceous, and tertiary series; the two former being found almost wholly in Great Britain, and the first series comprising all the strong refractory clays found both in Scotland and England. In the latter country, those deposits were chiefly worked in the districts around Stourbridge, Leeds, Newcastle, Durham, the Forest of Dean, Buckley, Shropshire, North and South Wales, and also to a small extent in the north and midland districts of Ireland. In Scotland they were found practically in the whole of the district containing the coal measures; the most refractory being those which were in the millstone grit, and lying in the district between Garnkirk and Bonnybridge. The thickness of fire-clay seams varied considerably in a manner similar

to those of coal. They did not, however, lie in beds of such uniform thickness as seams of coal, that being specially the case with ganister, the seams of which usually presented a wavelike appearance. In their own pit at Bonnyside, the working face averaged from 18 to 20 feet in height, having various seams of clay, ganister, and coal. The average selling price of raw fire-clay in the official returns of some years ago was only 3s. per ton at the pit, and it could be quite readily understood that only those seams which did not lie at any great depth from the surface, and were of considerable thickness, could be worked at a profit. Where, however, the clay was mined along with coal, the depth and thickness of seam were not such important factors.

Mr. Stewart proceeded to deal with the preparation and handling of the clay—describing the processes of milling, moulding, drying, and burning; then referred to a few of the more common troubles of the brick manufacturer; and concluded by examining the analysis of the clay. Having explained the first three processes, he said that after being lifted from the drying-floors, the goods were taken to the kilns, in which they were "set," or built up, ready for firing. There were many types of kilns for these purposes; those principally used in Scotland were the Newcastle and round kilns with up and down draught. Experiments had recently been made in connection with gas-fired continuous kilns, which were now showing better results. After the kilns had been filled and the doors built up, the fires were lit. During the first 48 hours of firing, the heat was being gradually raised, so as to enable all moisture to be evaporated. The kiln was then brought up to its maximum heat, and continued at this temperature for about 48 hours. The greatest care had to be exercised during the operations, as if the heat were raised too rapidly it might result in the materials being spoiled or cracked. On the other hand, if the maximum temperature, after being reached, was not sustained for a sufficient period, it would result in what was locally known as a "white kiln"—*i.e.*, underfired bricks.

Passing to the portion of his subject which was of special interest to the visitors, Mr. Stewart said that if the clay was to be used for making retorts instead of bricks, the greatest care should be given to selecting and picking it; and nothing but the purest material should be used. Owing to the heating and cooling to which retorts were subjected, the danger of cracking and splitting was greater than that of bricks; and it had been found that clay for this purpose was improved by the admixture of a very large percentage of "grog." As had been shown that day, instead of being moulded in one piece or at one operation, retorts were built in vertical sections in consecutive rings, about 15 inches deep; the builder using an inside drum of the shape and dimensions required, and building the clay round it—the outside diameter being regulated by a collar or profile. A new ring could be added every two or three days, and an ordinary 9-feet retort could be built and sufficiently dried for burning in from four to five weeks from the time when it was first laid down. The increased thickness of the neck was obtained by using a larger outside profile, and the bolt-holes were cut to template after the retort was somewhat dry. In order to give the outside the requisite smoothness, it was polished by the builder a few days after each ring was built and slurried over with a mixture of wet ground clay, so as to give a uniform colour throughout. Owing to the height and weight of the retorts, great difficulty was experienced in handling them, or burning them economically, unless this was done in specially constructed kilns with removable roofs. In some districts, machines had been introduced for the moulding of retorts in one piece, on a somewhat similar principle to ordinary pipe-machines. In Scotland, however, hand-made retorts were still most in favour.

Proceeding to examine some of the more common troubles which a brick manufacturer had to encounter in the making of fire-clay goods, Mr. Stewart said the principal one was shrinkage. This contraction was two distinct operations. Roughly speaking, the first took place while the bricks were lying on the drying-floor; and the second while they were being burnt in the kilns. For ordinary fire-clays containing about 2 : 1 of silica and alumina, the contraction was one-twelfth. Therefore, an ordinary 9-inch fire-brick required to be made in a mould 9¾ inches long, and accordingly thicker and broader than the requisite fired dimensions. The shrinkage was largely dependent on the proportionate percentage of silica and alumina. If the silica content were increased, the contraction decreased until the composition of the brick reached an analysis of over 90 per cent., when expansion (instead of contraction) took place during burning. It was, therefore, important—where flat arches of large diameter had to be built with bricks of ordinary fire-clay quality, showing an analysis of about 2 : 1 of silica and alumina—that these bricks should be burned at an extremely high temperature, as, should the arch in working practice be subjected to a higher temperature than that at which the bricks had been burned, further contraction would take place, resulting in sagging, or perhaps the total collapse of the arch. When ordering bricks for such purposes, the greatest care should therefore be taken with the dimensions, so that they might fit skin to skin. In this connection, many furnace builders, instead of using ordinary fire-clay materials, now employed a special brick made of silica clay, which showed no contraction, and also used silicious clay instead of ordinary fire-clay for jointing. It was, however, to the manufacturer that shrinkage caused the most trouble—that being so great in some cases as to make it impossible to use some clay alone, owing to the large amount of breakage which occurred during drying and burning. In addition to this, some clays were also very liable to warp, and others to swell, during the process of manufacture. In all these cases, however, it had been found to be of considerable advantage to mix a percentage of "grog," or ground bricks, along with the fresh-ground clay. This material, having no fire-shrinkage in itself, tended to decrease the shrinkage of the mixture during drying and burning.

Mr. Stewart concluded with a few observations on the subject of analysis. He said the best fire-clay contained approximately about 55 to 65 per cent. of silica; 30 to 40 per cent. of alumina; 2 to 3 per cent. of oxide of iron; and 1 to 2 per cent. of alkalies. The principal elements, therefore, were silica and alumina. Both these minerals were only fusible at very high temperatures. The brick which had been found most suitable for ordinary furnace work contained the above-named proportions of silica and alumina. It had been found that if the percentage of silica were increased, it had a tendency to lower the fusible point of the brick, until it reached a total content of about 90 per cent.; while above that, the increasing amount of silica gradually raised the temperature of fusion, until it reached the melting-point of pure quartz—*i.e.*, 3325° Fahr. On the other hand, if the content of alumina were increased, it rendered the brick more liable to warp and twist during burning. The principal factor, however, in the refractoriness or otherwise of a fire-clay was the proportion of fusible impurities which it contained. These were, particularly, iron, potash, soda, titanium, lime, and magnesia. In ordinary fire-clays of the first class, the proportion of iron should not be more than 2 to 3 per cent. Any quantity above this would immediately lower the point of fusion, and relegate the brick to the second class. If the iron present existed in the form of iron pyrites in small nodules, this fusible factor could be largely eliminated by careful handling. In practice, chemical analysis was not always the true index as to the refractoriness of ordinary fire-clay, the physical condition being in some cases almost of more importance as a controlling factor than the chemical contents. It had been long recognized in practice that the size and shape of individual clay particles—in other words, the grain of the clay—had much to do with the heat resistance; that was to say, clays containing coarse angular grains stood higher temperatures, other things being equal, than the dense and fine-grained varieties. This point, as well as the presence of a large percentage of alkalis, might explain the reason why certain clays, usually wrought in conjunction with coal, and close in grain, though low in iron content, were not suitable for furnaces where the highest temperatures had to be resisted.

Mr. J. Lowe (Glasgow) said as gas engineers they were very much interested in the maintenance of retort-benches and fire-brick work. They knew that fire-bricks subjected to such temperatures as those to which they had to be exposed in gas-works had not always a very long life. They sometimes cracked and fused, and deteriorated in other ways, and had to be renewed in the course of a few years. The design of the retort-bench, he might put it, was the first function of the gas engineer; but second, and not in any way inferior, to it came the question of maintenance. It was of the utmost importance to them to get fire-clay goods of such a character that they would be durable. The ideal fire-brick, of course, had not yet been produced; and he felt sure that there was a great field for the supply of bricks of even better quality than those at present on the market. It had been very instructive to have had the privilege of going through the works, both down the mine and in the workshops, and seeing how the bricks and the retorts were made, and how they were fired; and what they had seen might help them when they had to design bricks for purposes for which they required them.

Mr. S. B. Langlands (Glasgow) desired to thank Mr. Stewart for the very instructive entertainment the members had had, and said he hoped he would convey to his Directors their indebtedness to them for their visit.

The President expressed the indebtedness of the Association to Mr. Stewart for the very educative visit they had had. The explanations of the process of fire-brick making had been very clear. When they considered the number of operations, and remembered that the prices obtained for the finished bricks were only from 11s. to 15s. per ton, it was difficult to understand how there could be a profit on the work. He noticed that Mr. Stewart employed Seger cones for ascertaining the heat. He should like to ask him if he had ever used a pyrometer; and if so, if it was a success. The suggestion had been made that they might discuss the paper some other time. If the Committee could arrange for it, he was sure they would be very pleased to have some further remarks upon it.

Mr. Stewart thanked the members for their kindly references to his paper. Pyrometers were not generally in use for testing the heat in kilns in ordinary fire-brick works, because they were expensive. But recently there had been patented a new pyrometer, called the "Féry Radiator," which promised to be less costly than any in the market. They found, however, that the use of test pieces was a sure way of working. Not only could they test the heat of the kiln at a certain period, but ascertain whether a brick was burnt through and through—whether oxidation had taken place right through the brick. He hoped the visit had been instructive; and if, as the President suggested, the paper should be taken up for discussion at a future meeting, he should be very pleased to attend and give all the assistance he could.

This brought the proceedings to a close.

MANCHESTER JUNIOR GAS ASSOCIATION.

On Saturday the Association held their Seventh Annual Dinner, at the Exchange Hotel, Manchester.

After the Loyal toast had been duly honoured, Mr. C. Berry proposed "The President;" and Mr. R. H. Ginman thanked the members and friends for the support they were giving him during his year of office. Mr. T. Thorp proposed "Kindred Associations," remarking that every junior with a spark of ambition was looking forward to the day when he would be able to join the Institution of Gas Engineers; and in including the Institution in the toast, he ventured to think the time would come when the highest official position would be held by some who to-day were members of the Junior Associations.

Mr. J. H. Brearley, the President of the Manchester District Institution of Gas Engineers, in reply, said he liked the term "Kindred Associations," for they were all alike bound together for a common object. It was difficult to define what was a senior and what was a junior member of the gas industry. The old saying "What Lancashire thinks to-day, England thinks to-morrow," was not only true politically, but had been so in connection with the Junior Gas Association movement; and he would urge them to cultivate individuality of thought, so as to strike out on fresh lines and keep ever in the forefront. Mr. C. Roper, Secretary of the Yorkshire Junior Association, also replied on behalf of the Junior Associations. The guests of the evening were Mr. Brearley, Mr. Isaac Carr, Dr. Grossmann, and Mr. Roper; and to these gentlemen Mr. D. V. Hollingworth proposed the toast of "Our Guests," to which Dr. Grossmann replied. Mr. Carr proposed "The Manchester and District Junior Gas Association," and said he had watched the proceedings of the Association with interest and profit from its very infancy. In years gone by, a man was marked by the stamp of the works at which he had been trained; and he bore the impress of the engineers under whom he had served. Now, thanks to the Junior Associations, the young men were looking over other works and getting a broadened outlook. His own success he attributed to attention to small details; and he ventured to urge its importance upon juniors present.

DOMESTIC AND INDUSTRIAL USES OF GAS.

Last Tuesday evening, a paper on the above subject was read by Mr. F. W. Goodenough to the members of the Bartholomew Club, in their club room at Snow Hill, E.C.

Mr. Goodenough said that one of the oldest jokes in existence was about the lying gas-meter; but anyone who had an idea that it was an unreliable instrument, was much mistaken. For an instrument set in position and left without attention for years, it was a remarkably accurate recording machine. If it erred, it was more likely to register against the company than against the consumer. Over a period of five years, 50 per cent. of the doubted meters (not the meters actually in use) had proved on test to be accurate, or practically so. Of these, 25 per cent. had been shown to be too slow, and 25 per cent. too fast. On the face of it, this seemed an even balance; but, as a matter of fact, when a meter registered against the company the probabilities were that the error was much greater than when it registered against the consumer. He advised his hearers to learn to read the index, and to check the gas consumption each week, the same as they did with their food or coal. He afterwards proceeded to detail the developments in the gas industry by the invention of the bunsen burner, which rendered it possible to use gas for heating purposes, and led up to incandescent lighting.

After speaking of the advantages of incandescent lighting as compared with the flat-flame system, Mr. Goodenough recommended the members to entrust the maintenance of their incandescent burners to the gas company, and said it was quite a mistake to rely upon casual attendance, or wait until something had gone wrong. Houses lighted by gas, he said, had generally a much more cheerful appearance than had those lighted by more expensive illuminants. In heating and cooking, gas had brought about almost a revolution, and robbed the domestic-servant problem of many of its terrors. His Company had half-a-dozen ladies who were experts in the use of gas for cooking, and who were sent, free of charge, to any consumer who desired their services. It sometimes happened that the husband sent an application, and when the expert arrived she found that the wife and servant supposed that they knew as much as she did. It required in these instances tact and judgment to get into the house at all or into the kitchen; but the result invariably was that the wife and the servant, even though they might have been using gas for cooking for years, found they had a good deal to learn, and profited by the visit.

After referring at some length to the advantages which gas possessed over coal for cooking, Mr. Goodenough spoke of its use in laundry work, and for obtaining hot water either constantly by circulation or quickly on sudden emergencies. There was, he said, an impression abroad that gas-fires were not so healthy as coal; but many of the most eminent men in the medical profession now, immediately they saw that a person was in for a long illness, ordered a gas-fire to be put in the room. The reason for this was that an even temperature could be maintained, that there was no fear of the fire going out through inattention, and that the noise of cinders falling and of putting on coal was obviated. After quoting the conclusions arrived by the "Lancet" Commission, that gas-fires were not prejudicial to health, the speaker asked how they could be, seeing that the heat from the gas-fire was exactly the same as from a coal-fire, except that the latter was burning crude instead of purified gas. His Company had more gas-fires proportionately, in doctors' houses in Harley Street and neighbourhood, as well as in other districts, than in the houses of any other class of the community. Some people put in gas-fires because their chimneys smoked, without seeing that steps were taken to counteract the down-draught; and the results in these cases were not satisfactory. But where there was no down-draught, or where means were adopted for dealing with it, and the room was properly ventilated, there could be no possible objection from a health point of view to gas-fires in rooms. The introduction of gas-fires in a large house would enable the owner to dispense with one servant. He was not going to say that, hour for hour, a gas-fire was as cheap as a coal-fire. It was not as cheap as a coal-fire in a room where constant heating was required, unless the saving in labour and in dirt were taken into account. The direct and certain saving was in its use in a room only occasionally required, and also in the quickness with which it could be lighted, and put out; and there was the indirect saving in labour and preventing damage from smoke and soot.

Turning to the use of gas for industrial purposes, Mr. Goodenough said the originators of the gas industry would be astonished to find the wonderfully broad basis upon which it now stood. In practically all the large hotels and restaurants, it was used for cooking purposes; it was used in newspaper offices in connection with linotype machines and gas-engines; it was employed for cloth pressing, tobacco drying, all kinds of metal working, the manufacture of golf balls, and endless other purposes. Some £500 a year was paid by one firm for gas which was exclusively employed in the bending of walking sticks. Large quantities were even consumed in the making of electric light cable, which was strong evidence that electricity was not economical as a heating agent. It was surprising how many industries would be brought to a standstill, or seriously inconvenienced, if the supply of gas was stopped.

A discussion followed, in which the majority of the speakers gave testimony to the value of gas for several purposes.

Replying to some questions and criticisms, Mr. Goodenough gave several reasons why the price of gas was higher on the north side than on the south side of the Thames. Referring to some remarks as to the supposed dangers from gas, Mr. Goodenough said that the real risks from gas were extremely small, while those from electric light were often not realized as they should be. A number of fires were known to be caused by defective electric insulation, and there were a number of unknown fires which probably arose in the same way. Fires from electric wires destroyed the evidence of their origin. The speaker proceeded to call attention to a report from the London County Council, which pointed out that fatal and other accidents in poor neighbourhoods had enormously decreased since slot-meters enabled the inhabitants to substitute gas for paraffin oil.

A hearty vote of thanks to Mr. Goodenough for his paper brought the proceedings to a close.

Power-Producing Efficiency of American Coals.

In the Engineering Supplement to "The Times," Mr. J. Shober Burrows has lately been dealing with the subject of coal-testing, in connection with the work of the Fuel-Testing Committee of the United States Geological Survey. It appears that some scepticism was expressed as to the claims made by the Committee in regard to the power-producing efficiency of coals used in the gas-producer and gas-engine; and therefore an "endurance test" was undertaken, extending over 24 days. The average of six analyses of the coal used showed 14·68 per cent. of moisture, 30·98 per cent. of volatile combustible, 42·93 per cent. of fixed carbon, and 11·41 per cent. of ash, including 1·33 per cent. of sulphur. The heat value of dry coal was 12,343 B.Th.U. per pound. The coal was broken to about 3-inch size, and delivered to the charging-floor of the producer by a belt conveyor; and it was charged into the producer at intervals varying from 25 to 30 minutes. The weight of each charge was 150 lbs. The gas left the generator at an average temperature of 644° Fahr., and passed through a water-seal dust collector, and thence to the scrubber. From there it went directly to a centrifugal tar-extractor, which removed the greater portion of the tar. It was then delivered direct to the holder—no further attempt being made to purify it. During the entire test, calorimetric determinations of the heat value of the gas were made every 20 minutes, and volumetric analyses every two hours. The average heat value of the gas for the entire run was 156·1 B.Th.U. per cubic foot. Observations relating to the tar extracted during the test are of special significance, as it has often been stated that no plant which separates the tar mechanically could run for more than five or six days without shutting down. The total tar extracted during the test amounted to 14,950 lbs., or about 143 lbs. for every ton of coal burnt in the producer. The tar did not contain more than 10 per cent. of water. The engine ran in perfect order at all times during the period of the experiment, and at the end was found in unimpeachable condition. The producer plant was also in excellent order.

REGISTER OF PATENTS.

Incandescent Gas Lamps, Burners, and Fittings.

HELPS, G., of Nuneaton.

No. 328; Jan. 5, 1906.

This invention consists in a burner in which the air inlets are so protected that they may be located outside the lamp globe or casing with a flexible connection by which the burner can be readily disconnected and removed for cleaning and other purposes.

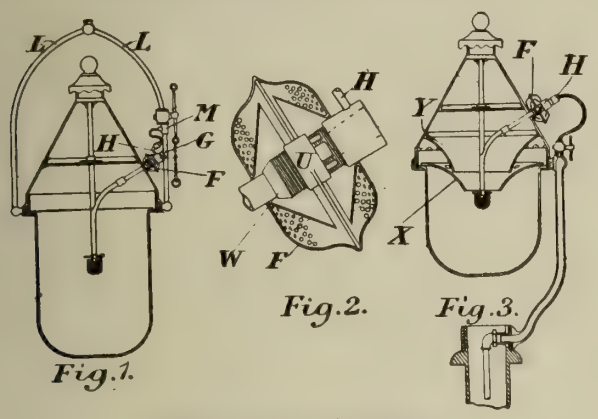


Fig. 1. Fig. 2. Fig. 3.

Helps' Street-Lamp Attachment.

Fig. 1 shows one form the invention may take when applied to an ordinary well lamp. The burner-tube is rigidly secured to the top of the lamp by a support and bridge piece. It is in two parts, secured together by a socket or other attachment. F is the protector surrounding the air cone, an enlarged view of which is shown in fig. 2. G is the movable nipple plug fitting into a socket, and H the gas connection terminating in the plug and socket joint to which a flexible tube is attached. The gas passes down the supporting arm L; the flexible tube being attached to the branch at M.

Fig. 2 shows an air-cone protector, with suitable baffles and air inlet perforations. The protector is secured to the air adjusting ring U by arms, so that it can turn freely on the screwed air cone W.

Fig. 3 shows the invention applied to a well lamp on an ordinary column. Here the air for combustion is prevented from mixing with the products of combustion by the introduction of a deflector Y. The air passes to the mantle through holes in the reflector X. In this case there is only one plug joint; the nipples being on the plug to which the flexible tube is attached.

Obtaining Ammonia from Gas Liquor.

FILLUNGER, A., of Mährisch, Austria.

No. 11,077; May 11, 1906.

This invention (the specification of which is not illustrated) consists in the waste water coming from the apparatus being led back into the gas washer, scrubber, or the like, after having been cooled, in order, when charged with fresh ammonia, to be led again into the apparatus and, after giving off the ammonia newly taken up, to be led back into the scrubber, and so on in a perpetual cycle.

The observation has been made, says the patentee, that in this cycle the proportion of fixed or non-volatile ammonia salts in the waste water does not increase; so that an addition of lime which is required for the precipitation of the fixed ammonia salts is not necessary. This observation leads to the obvious supposition that the retort gases contain no fixed ammonia salts; that these rather are only formed by the process of chemical transposition during the washing of the gases with ordinary water under the influence of the salts dissolved in the water. Accordingly, if no fresh water is brought into use in washing, there can be no increase of fixed ammonia salts. Indeed, experiments have been made, in which retort gases were washed with distilled water, with the result that absolutely no fixed ammonia salts were present.

If in this improved method, as is usual in other methods, steam at a temperature corresponding to the pressure were employed for driving off the ammonia from the gas liquor, the quantity of waste water would be increased by the vapours contained in the steam and condensing out of it. The constantly increasing quantity of water would make it necessary to allow part of the waste water containing exclusively fixed ammonia to run away, which would naturally involve a loss of ammonia, or, in order to avoid this, a part of the gas liquor would have to be distilled with lime, which, however, would be likewise disadvantageous.

Now the present invention relates also to a method for preventing the washing water from increasing in amount on account of the free water contained in ordinary steam, and for preventing the ammonia water from becoming diluted, which would otherwise be the case on account of condensation. This object can be obtained in a two-fold manner according to whether ordinary or superheated (that is dried) steam is employed. In the latter case—that is, when superheated or dried steam is employed—the washing water is prevented from increasing by there being no free water contained in the steam, and by a greater calorific effect being attained by means of the higher temperature, whereby it is possible to consume less steam, so that less condensed water is formed. In the present case, the distillation of the ammonia water may take place in the ordinary column apparatus heated directly.

If the conditions of the case require steam to be employed at a temperature corresponding to its pressure, the object of the invention can be obtained by treating the ammonia water in column apparatus heated indirectly; the employment of superheated or dried steam being possible, of course, but more expensive.

The method according to the present invention may be carried out in the following manner: The gas liquor is distilled in apparatus of known kind—for example, in a column apparatus, without an addition of lime; the free ammonia being driven off, while only small quantities (about 0·05 per cent.) of the fixed ammonia present in the form of salts are contained in the waste-water running out of the apparatus. Now this waste water is preferably pumped on to a tower or like apparatus and cooled to the temperature of the air, or some degrees lower, in order then to be employed in trickling through the scrubber without anything further being done to it. Losses of the ammonia contained in the waste water are excluded, as the ammonia is exclusively present in non-volatile form.

The gas liquor running away from the scrubbers which is now again enriched, is led again to the distilling apparatus in order to be here freed from the ammonia taken up in the scrubbers; the water being then again used in trickling through the scrubber for the purpose of enriching itself, and so on. Thus one and the same quantity of gas liquor continuously circulates; and the addition of new water for washing is superfluous.

This circumstance, it is said, makes the present method particularly suitable for plants in which there is a scarcity of water. Further, since the total quantity of waste water leaving the distilling apparatus at any time circulates in the working of the plant, the quantity of ammonia which was hitherto in the waste water which ran away is retained, or the loss of ammonia which took place in the methods formerly in use is avoided.

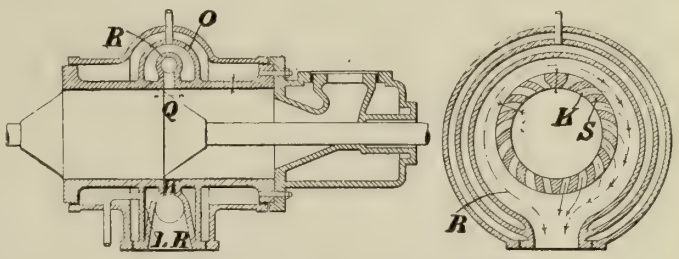
A further advantage consists in avoiding milk of lime, the employment of which (apart from the heavy cost connected with its supply) causes a number of disadvantages, inasmuch as the milk of lime pumped into the distilling apparatus causes the formation of hard deposits in the apparatus, makes necessary a thorough cleaning of the plant after a comparatively short time of work, involving a discontinuance of operations for a time, and, moreover, necessitates an increased use of steam while working. Further, since the so-called waste water running out of the apparatus during the distillation with lime must be led into reservoirs for the purpose of depositing the mud before it can leave the works, these settling reservoirs must naturally be drawn off from time to time and the mud which has collected must be taken away, which again leads to a considerable increase in the cost of working.

Gas-Engines with Two-Stroke Cycles.

SCHWEHM, P., of Hanover.

No. 873A; Jan. 12, 1906.

In this arrangement of gas-engine, the patentee proposes to increase the sectional area of the partitions which separate the consecutive exhaust slots from each other, whereby the cylinder walls are, without danger of cracking, enabled to transmit the tensile strains caused by the explosion.



Schwehm's Two-Stroke Cycle Gas-Engine.

The exhaust pipe or passage R surrounding the cylinder is circular in cross section. It is placed at a short distance from the cylinder, and is connected with the latter not by plain slots in the cylinder wall, but by special ports K provided with special cooling walls. In this way, it is possible to increase the height (or radial length) of the ports and of their partitions or guides S to any desired extent, without increasing the uncooled mass of the partitions. On the contrary, the walls of the ports, being themselves kept cool by the water surrounding the exhaust pipe, serve to cool the partitions. The width of the uncooled zone Q of the cylinder is thus rendered independent of the sectional area of the exhaust pipe R, and depends only on the (axial) width of the exhaust ports.

To increase the cooling effect, a canal may be formed around the wall and fed at its deepest point L with fresh water through a separate feed-pipe. The cooling water may pass from the canal at its highest point into the cooling jacket of the power cylinder through openings O. The latter may serve for admitting cooling water from the cooling jacket of the cylinder to the canal, in case it has been inadvertently omitted to open the feed-pipe at the time of starting the engine.

Incandescent Gas-Burner.

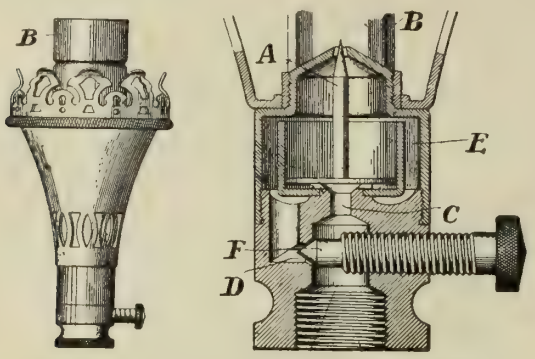
BOULT, A. J.; a communication from the NATIONAL GASLIGHT COMPANY, of Michigan, U.S.A.

No. 18,043; Aug. 11, 1906.

The patentees' object is to control the feed of gas through a bunsen regardless of any variation in pressure.

As shown next page, the burner comprises a nipple surmounted by a removable hollow cap, and with a cylinder carried by the upper end of the nipple and confined within the cap. There is also a self-adjusting needle-valve carried by a disc A movable within the cylinder, and a bunsen burner or mixer tube B having air inlets above the cap. The nipple has formed in it a chamber from which a passage C extends upwardly, to admit gas beneath the disc, and a passage D communicating laterally with a vertical passage, which, in its turn,

communicates with a chamber E formed between the cylinder and the interior of the cap. The nipple preferably has at its top a boss through which the passage C extends; and the cylinder (open at its upper end) has an interned flange at its lower end which fits upon the boss and is secured on it by a burr. The needle-valve extends, when the disc is at the lower end of its traverse, into an orifice with which the cap is provided at its apex—a passage being afforded for gas, however, in this position. The lateral passage D is guarded by a valve F, which has a threaded shank extending through the opposite wall of the nipple. A knurled head enables adjustment to be made; and the reduced extremity forms the valve.



National Gaslight Company's Regulating Burner.

In the normal operation, the gas is admitted through the lateral passage D, the vertical passage connected with it, and the annular chamber E, and the pressure is also admitted to the cylinder beneath the disc. The pressure causes the needle-valve to rise and obstruct the orifice until the back-pressure due to the constricted opening, taken in connection with the weight of the valve, is sufficient to balance the lifting force upon the valve. It will be obvious therefore that the device may be adjusted to varying pressures by regulating the position of the valve F, whose stem projects laterally from the nipple so as to enable this to be accomplished.

Producing a Constant Mixture of Gas and Air.

Aktiengesellschaft für Selas-Beleuchtung, of Berlin.

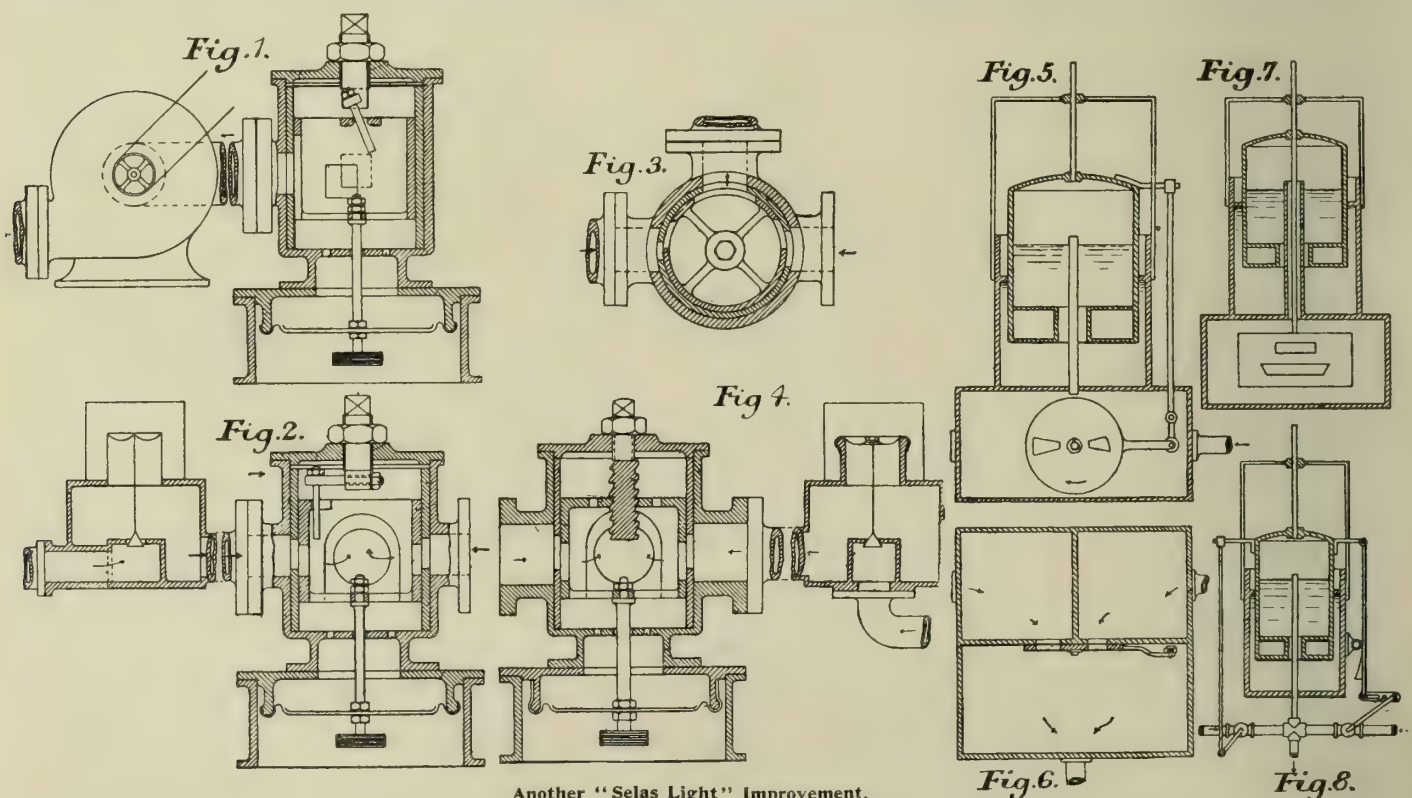
No. 21,847; Oct. 3, 1906. Date claimed under International Convention, Oct. 7, 1905.

This invention relates to a process for the production of a constant mixture of gas and air for illuminating purposes, with the employment of suction and forcing apparatus, the action of which is regulated in dependance upon the consumption, and which produces and sucks the mixture at low pressure, and sends it at an increased pressure into the service pipe.

As shown, the cross sections of the gas and air inlets are modified in two senses for the purpose of equalizing, on the one hand, the difference of pressure between the suction pipe for the mixture and the supply pipe for the gas, and, on the other hand, the difference of pressure between the suction pipe for the mixture and the air supply pipe. In addition to this, the regulating device is actuated dependantly upon the quantity of gas and air mixture withdrawn from the service pipe, but indirectly under the influence of the suction effect of the suction and forcing apparatus. In addition to presenting the possibility of regulating the operation in a simple manner, the process ensures that, even when the quantities of gas and air mixture withdrawn vary largely, a constant mixing ratio between the gas and air will always be obtained.

In order to obtain these objects, the inlets for the gas and air are enlarged and reduced under the influence of a governor in correspondence with the increase and decrease of the quantities supplied. By this means the pressure in the suction chamber is maintained at a given height, and irregular action of the suction pressure upon the admission apertures is avoided. At the best, however, it is only possible in this manner to maintain the suction pressure at a given height in the suction chamber with fluctuations within certain limits. These special fluctuations of pressure, the patentees remark, have their origin in the sources of error in the governor—for example, in the case of float-bells in the variations of the depth of immersion; with membrane governors, in the differences of tension which arise in the membrane; and so forth. It has also proved that even when the pressure in the suction chamber is maintained entirely constant, variations in the composition of the mixture of gas and air arise with varying withdrawals, even if the cross-section of the inlets is regulated dependantly upon the consumption in the manner described. The reason for this appears, they say, to be that the co-efficient of resistance for gases of different specific weights—such as illuminating gas and air are—does not alter proportionately with the enlargement or restriction of the apertures of different magnitude. Accordingly, the smaller the admission cross-sections are, the more speedily and higher does the resistance curve exceed the proportional amount. These causes, and others of undesirable variations of the mixture arising from sources of error in the apparatus, must be compensated for by a second adjustment of the cross-section of the inlets. This second adjustment of the cross-section takes place in positive dependance upon the first proportional adjustment of the admission cross-sections, owing to the fact that some or all of the cross-sections experience an additional adjustment, so that for every separate setting effected by the first proportional adjustment the errors are compensated for.

The process to be employed in accordance with the invention may be carried into practice in various ways. An obturating member common to the gas and air inlets, and effecting a simple movement, may be provided. In this case, the second adjustment is obtained by the special formation and position of the obturating edges and of the admission apertures. The second adjustment of the inlets may, however, also be obtained owing to the fact that the obturating member common to both inlets, in addition to receiving the movement dependant upon the consumption, also receives a further special movement, so that the double regulation is caused by the modification of the position of the inlets. This arrangement presents the advantage that the second adjustment may be variable, or capable of regulation. Further, the inlets for air and gas may be provided with separate obturators, which are influenced by the governor in dependance upon the consumption or the operation of the suction and forcing apparatus. The obturating member (or two obturating members) may be provided with special means for effecting the second special adjustment. For the rest, obviously the manner of the double regulation depends upon the number of inlets for gas and air.



Another "Selas Light" Improvement.

Several examples for carrying the process into practice are illustrated. Figs. 1 to 3 show an apparatus with a rotary forwarding device, and adjustable cylindrical obturating member. Figs. 1 and 2 show the governor in two vertical sections in two planes perpendicular to each other. Fig. 3 is a horizontal cross section. Fig. 4 represents another constructional form with adjustable obturating member. Figs. 5 and 6 illustrate in side elevation and horizontal section an apparatus the obturating member of which has curved closing edges. Fig. 7 shows a similar constructional form with inclined closing edges on the

obturating member. Fig. 8 shows an apparatus with separate obturating members for gas and air.

The process may be carried into practice in numerous ways. Not only bellows or bell governors, but other devices likewise are adapted for regulating the admission cross-sections; and the displacement of the obturating member may take place in any appropriate manner—say, axially, obliquely, or helically. In place of a cylindrical obturating member, as shown in figs. 1 and 4, a semi-cylindrical, or approximately semi-cylindrical, obturating body might be employed. The means for effecting the separate adjustment may be modified as desired. For example, in the construction represented in figs. 5 and 7, the openings of the gas and air supply pipes might carry the means for producing the second adjustment instead of the inlets of the obturating member. The admission edges may be of any appropriate kind, either inclined or curved (as shown) or stepped. The regulation of the forwarding apparatus may also be effected by driving it quicker or slower in dependance upon the consumption. Again, the alteration of the cross-section of the gas and air inlets might be produced by a liquid seal with varying position of the level—for example, by employing two liquid reservoirs communicating by a conduit; the contents of one of them being partially transferred to the other by the action of the suction process. It is said to be essential that in all cases the cross-section of the gas and air inlets should be altered in a double sense, for the purpose of maintaining constant the difference of pressure between the suction conduit on the one hand, and the supply conduit for gas and air on the other hand, whereby the means for automatically varying the cross-sections of the admission apertures (the so-called admission governor) may be displaced by means of the pressure or by the suction conduit, or in any other workable manner.

Incandescent Gas-Burners.

TWIGG, W. W., and WATSON, J. H., of Birmingham.

No. 1790; Jan. 24, 1906.

This invention is particularly applicable to inverted burners; its object being the "better mixing of the gas and air, thereby ensuring more perfect combustion." The patentees propose to insert in the tube of the burner one or more strips of metal (preferably formed into a spiral or twisted shape) in such a manner that the current of gas and air in its passage through the tube is divided into two or more parts, which, passing along the sides of the strips, is given a twirling or rotary movement—the currents again joining and mixing together at the lower end of the strips.

Gas-Mantles.

VAN VRIESLAND, A. I., of Scheveningen, Holland.

No. 18,152; Aug. 13, 1906.

This gas-mantle consists of flat woven, knitted, or plaited material made into the usual shape by drawing it over a suitable form. In this way it is said advantages are obtained in many respects, especially when used in connection with inverted burners. Those hitherto used, consisting of "pieces of hosiery," were made into the desired form by sewing together one of the openings in the hosiery. But in this way an aggregation of material arises in one part and a formation of folds, whereby the illuminating power of the mantle is diminished. The "new mantle," on the other hand, has its closed part quite smooth and uniform, and "consequently the rays of light are in no way prevented from radiating downwards." The mantle thus produced is subjected to the action of chemicals, having a contracting or shrinking action—such as lyes, acids, or salt solutions—whereby any existing folds are got rid of.

The patentee says he is aware that, according to patent No. 24,680 of 1905, a tubular material was treated in substantially the manner described, and he makes no claim thereto as part of the present invention, neither does he claim *per se* the use of flat material for the formation of mantles. What he claims is: "Incandescent gas-mantle, the distinguishing feature of which is that it consists of flat woven, knitted, or plaited material, converted into the form of a mantle by being drawn on to a suitable form, and subjected to the action of chemicals having a contracting or shrinking action—such as lyes, acids, or salt solutions—in order to remove any existing folds."

APPLICATIONS FOR LETTERS PATENT.

908.—ACKLAND, T., "Stopcocks." Jan. 14.
909.—HELPS, G., "Bunsen burners." Jan. 14.
949.—RADFORD, R. H., "Gas-heated furnaces." Jan. 14.
1033.—RICHARDSON, G., "Gas firelighter." Jan. 15.
1040.—REGAN, J., "Gas-burners." Jan. 15.
1056.—WISS, E., "Welding burners." Jan. 15.
1201.—MARKS, E. C. R., "Igniting gas-lamps by means of electric sparks." A communication from Aktiengesellschaft für Automatische Zund und Lösche Apparate." Jan. 16.
1235.—TWEEDIE, R. O., "Gas-burners." Jan. 17.
1263.—JOUVE, A., and GAUTIER, G., "Purification of gases." Jan. 17.
1294.—AHRBECKER, H. C., "Fluid meter." Jan. 17.
1308.—WEBSTER, M., "Enabling street and similar lamps to be lighted and extinguished." Jan. 18.
1313.—DANIELS, J. S., HIGGINS, E. P., and DANIELS, F. L., "Gas producers." Jan. 18.
1349.—TERRELL, T., "Incandescent burners." Jan. 18.
1389.—MILBOURNE, R. J., "Discharging purifiers." Jan. 18.
1393.—CARY, H. B., "Mixing a combustible with air." Jan. 18.
1394.—CLEVERLY, E. G., and ANDERSON, F. L., "Controlling the passage of liquids or fluids." Jan. 18.
1411.—MARSDEN, H., "Exhausting gases from retorts." Jan. 19.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

Westminster Electrical Laboratory Photometrical Tests.

SIR,—When I sent you my lamp test report for review, I anticipated receiving some adverse criticism. As, however, I am anxious to learn the views of gas people on the question of how gas-burners should be tested, I am willing to put up with a certain amount of adverse criticism. Your reviewer, however, has, I consider, treated me most unfairly, and appears to me to have gone out of his way to find fault with my methods where they are in reality much fairer than those which he would substitute.

In carrying out these laboratory tests, I have aimed at getting as nearly as possible to the conditions obtained in practice by the average consumer—not by the expert, who adjusts his gas and air supply every five minutes, and who cleans his chimneys and burners every other day. The average consumer knows nothing of these things. It must be remembered that, whereas in electric lighting the control of the conditions is almost entirely out of the hands of the consumer, in gas lighting everything depends upon the attention given by the consumer, if he is to obtain the best results.

I have taken the average consumer as my basis; and I maintain that my figures do serve as a very useful basis from which the relative costs of gas and electric light can be calculated, when the other determining factors are known. These factors are the price of gas and current, the minimum candle power required in the various rooms, and the habits of the consumer—such as, for example, the use made of his dining and drawing rooms respectively. I have calculated out for my individual use the costs for lighting my own house, and find that, in my case, the only room in the house that it would pay me to light by gas would be the kitchen, although a householder of different habits would no doubt be wise to light his house differently.

I would suggest that laboratory tests carried out on burners adjusted to give their best results are absolutely useless, and never will I agree to conduct tests under such conditions. I test electric lamps on their marked voltage, irrespective of whether that is the best voltage for each individual lamp; and I propose to test gas-burners in a somewhat similar fashion.

I quite agree with your reviewer that burners will not give the same results on different qualities of gas. I have felt this all along; but short of making a different set of tests in every town, I do not see how it is to be got over. Possibly, however, some gas engineers may be able to correct my results to suit their own gas.

The air supply to the burners did remain constant, as your reviewer suggests. This is quite fair. Only the Block burners were fitted with air-regulators. Very few gas-burners are fitted with air-regulators, as a matter of fact; and in spite of what your reviewer may say, I do not for a moment believe that the average consumer takes any notice of air-regulators. As to adjusting them for every change of pressure and quality of gas, that is most absurd. He does not do it; and nothing will ever persuade him to do it.

It is true that the chimneys were not cleaned during the 500 hours' run. This I maintain is in accordance with practice. I do not suppose one consumer in a hundred cleans his chimneys except when he puts on a new mantle.

The nipples of the burners were cleaned at intervals during the run. This was done in order that the consumption might remain constant, and in consequence of it I was able to obtain more concordant results than if I had allowed them to take their chance. I am now, however, inclined to think that I should have done better to have left them alone, in which case the candle power of the mantles in almost every case would have fallen somewhat more. I think that this would have been fairer.

As to cleaning the gauze caps during the run, I doubt whether one consumer out of a thousand ever does this except when renewing a mantle. The tests would indeed have been useless if I had ventured to do so.

As regards the question of the standard of light adopted, I would point out that standard incandescent lamps are superior to the pentane lamp for general use, and that, as a matter of fact, the pentane lamp only gives standard candle power when used in one situation—namely, in a particular photometer room at Bushy House. Even then elaborate corrections have to be made for humidity and barometric pressure. I have for some years past abandoned the use of the pentane lamp in my own laboratory, but take the standard pentane lamp at the National Physical Laboratory as my standard of reference. I obtain very much more accurate results than I used to do in the days when I used the pentane lamp in my own laboratory. My results are quite comparable with others using the pentane lamp as their standard, if they have in their photometer room the same atmospheric conditions as at the National Physical Laboratory, and if also the room is equally lofty. From what I have heard, however, I am inclined to think that the majority of gas engineers have not these conditions, and are obliged to ignore the variations of their pentane lamps owing to the want of a really constant light against which to test them.

I would point out that your reviewer is incorrect in stating that I have given a widely different consumption for the same burners with different mantles on them. As a matter of fact, each mantle was run on an absolutely new burner. The burners were not all bought at the same time; and it is not my fault if the makers supply burners differing to a certain extent in consumption. The fact is that burners are now made so badly that no two of them taken out of the same batch have the same consumption. For this reason I am doubtful whether I should not have done better to have determined the mean consumption of a number of burners at standard pressure, and then to have tested all at this consumption, varying the pressure slightly for each burner. As a matter of fact, I did vary the pressure slightly during the tests, so as to get the same weight of gas through the nipples throughout each run, no matter what variations of temperature or barometric pressure

took place. I shall be glad to hear the views of gas engineers on this question.

I am not afraid of being called upon to substantiate my figures. The conditions of the tests are clearly stated; and under these conditions certain results were obtained, and nobody can refute the facts.

Finally, I would like to state that I have endeavoured throughout to free my mind from bias in carrying out these tests, and as the report is intended for the use of those engaged in either the electrical or gas industry, and not for the consumer direct, I can have no object in trying to make one form of lighting come out worse than the other. The people who subscribe for these tests are already committed to either gas or electric lighting, and are not consumers wavering between the adoption of gas or electric lighting. Such persons, however, are probably desirous of knowing what their rivals are able to do; and the report shows them the sort of results that are likely to be obtained in practice.

If any gas engineer can give me advice as to how I should modify my methods of testing on the next occasion, I shall be exceedingly grateful—bearing in mind that my object is to get at the efficiency of gas lighting under average working conditions.

LANCELOT W. WILD.

York Mansion, York Street, Westminster, Jan. 25, 1907.

[There is no doubt that Mr. Lancelot Wild believes thoroughly in himself and his methods of testing incandescent gas-burners. To discuss with one who holds such dogmatic views as to what gas consumers do, or refrain from doing, is almost useless. According to our correspondent, the average gas consumer continues to neglect the practical lessons of a quarter-of-a-century's experience, and the instruction of those who supply him with gas has been all in vain. The average consumer, he holds, still treats his burner and mantle in the old barbarous fashion; and the consumer's intelligence has not taught him that he can get a superior light by the mere regulation of his gas-tap and the air-collars (which most modern burners possess), and by cleanliness. "Therefore," in effect argues Mr. Wild, "because it is my belief that the average consumer treats his burners and mantles in a barbaric manner, I shall introduce the same treatment into the science of photometry—the science of photometry as practised at the Westminster Electrical Laboratory." We have certain admissions in Mr. Wild's letter that prove that our assumptions (which, in view of the results of Mr. Wild's tests, we felt sure were well founded) were correct, and which allow us now to recommend the first volume of tests, not as tests of the capabilities of incandescent gas-burners and mantles, but as tests of what the indolent consumer obtains by neglect in the use of those burners and mantles. It is altogether a new proposition that burners and mantles should be debited with negligence, and that credit should not be given to them for all the virtue they show themselves to possess in the hands of the intelligent consumer, who, knowing the way to get the best value out of his gas, gets it. Whether the consumer is intelligent or not, each time he touches the gas-tap he changes or regulates the consumption. That Mr. Wild did not do. Now, if Mr. Wild will make a similar series of tests, using burners and mantles as a man would who wants to get the most out of them (not as the "expert" whom Mr. Wild apparently knows who adjusts his gas and air supply every five minutes, but as the consumer does who, when he lights up each day, turns his gas-tap until he gets maximum light, and as many do, if the light is not good, gives the air-shutter a turn, and occasionally, when the light begins to decline, lifts off the mantle and blows through the burner head to clear the gauze), then there may be use in the old and the new tests to show consumers, by comparison, what they lose by neglect. Mr. Wild's experience may not have taken him back to the City of London Gas Act of 1868, in which the principle was laid down that, in the testing of gas, the standard burner was to be used in the manner that would realize from the gas its greatest illuminating power. That is a just principle, which is recognized again by the air-regulating damper in the latest standard test gas-burner; and it is the just principle that we wish to see applied to the tests of all burners. We agree that the control of the electric lamp is kept entirely out of the hands of the consumer, simply because there are no practicable means by which there can be regulation on his part; and so much the worse for the consumer, as Mr. Wild's experience with varying voltages on the Westminster electricity system has no doubt led him to appreciate. But the electric lamps were all tested at their marked voltage, and that voltage was kept constant. That is not the condition that obtains in the case of the consumer. In this, Mr. Wild favoured the electric lamps; but he declined to recognize the favourable condition of control that every incandescent gas-burner (which, excepting in the case of one or two special makes, has every part separable by unscrewing) puts into the hands of consumers. Therefore the tests are not comparable as a basis for cost; and we must seriously protest against the negligent consumers' ill-use of burners and mantles being taken as the basis of any such comparison of cost with electric lamps. On all grounds, we assert the tests are unfair, and are not comparable. Mr. Wild imposes a stupendous task in asking that the habits of individual consumers should be considered in relation to costs. As an expert, Mr. Wild would exercise care with his electricity, and reject lamps when their efficiency has dropped below a certain point. Perhaps the "average" electricity consumer does not do one or the other. But are they "factors" for consideration in discussing relative costs? The question of the pentane standard lamp is referred to in our editorial columns.—ED. J.G.L.]

The Transport of Sulphate of Ammonia.

SIR,—As a subscriber to the "JOURNAL" (through my company) for a number of years, through special interest, I have each week scanned your pages in the hope of seeing an article describing the handling, &c., of a consignment of sulphate of ammonia from leaving the gas-works or coke-ovens to arrival and distribution in a foreign part—say, at Kobe, Japan.

Such an article would explain (to me at any rate) why it is necessary to bag sulphate in (say) 2 cwt. quantities; why if this is necessary for carrying by natives overland on arrival at port (as I have so far had explained to me) the sulphate is not sent (say) loosely in special compartments of the ship's hold, and packed at the foreign port into bags, where perhaps the labour cost of packing would be cheaper, and also packing material for the lesser carrying distance. Second-hand bags at present cost 5¾d. each.

Perhaps *ignoramus* will be your reply; but, at any rate, I think—apart from the business instruction—a very interesting and readable article might be written on this subject.

M.C.

[The transport of sulphate of ammonia from the manufacturers' works to the hands of consumers abroad is practically the same as that of any other manufactured article—there is nothing special about it. The reason it is not carried in bulk is that, on so valuable an article, too much waste would be involvod in transit by railway, from railway to free on board ship, and during discharge abroad—perhaps into lighters, perhaps on to open quays. It is just the same with other goods of a like character. It rarely happens that any one shipment would fill any one hold; and it is very doubtful, in any case, whether the owners of the steamers would carry sulphate of ammonia in bulk even if shippers cared about taking the risk of wastage. Sulphate of ammonia is, moreover, a solvent salt; and is therefore specially liable to damage by water. There would also be risk of damage by dirt or other discolouring matter.—ED. J.G.L.]

Dangers of the Electric Light.

SIR,—At the inquiry held by the City of Dublin Coroner in connection with the unfortunate explosion in the purifier-house at the Dublin Gas-Works, I notice that Mr. E. Jackson, H.M. Inspector of Factories, stated that, "after his experience of the accident, he should, in future, recommend electric lamps with a dry battery instead of electric lamps with wire attached, so as to do away with the possibility of fusion, which he thought was the cause of the accident." In your leading article on the subject in the "JOURNAL" for the 22nd inst., you state that: "In many gas-works in the country, electric lighting is the vogue on the score of safety, in those buildings where, accidentally, explosive mixtures may be formed. To the engineers of such works, this accident will be suggestive, and where necessary precautions will be taken."

I am, however, writing to give a short account of an occurrence which took place in a house in which I was staying last September. This house had recently been fitted up with incandescent electric lights. A bottle was being uncorked in the dining-room, when the cork flew out and struck one of the electric lamps. The glass bulb broke, and there was immediately a blaze of light, owing apparently to the formation of an arc, which fused the brasswork of the fitting, with the result that the molten metal fell down, lighted the table-cloth, and caused other damage.

It has struck me that this occurrence may be of interest at the present moment, and possibly assist Mr. Cotton in coming to a conclusion as to the manner in which the explosive mixture in his purifying house was ignited.

D. H. HELPS.

Gas-Works, Reading, Jan. 24, 1907.

Gas Fatality at Ealing.—On Sunday afternoon, some friends who called on Mr. and Mrs. Smart, at Lynton Avenue, Ealing, were unable to gain admission to the house; and on the police forcing an entrance, the couple were found lying dead on their bedroom floor, the place being full of gas. It is reported that the fatality was due to an escape from a sliding chandelier which had not been supplied with water.

Dispute at Bingley.—A disagreement has arisen between Messrs. R. Dempster and Sons, of Elland, and the Bingley Urban District Council in regard to the working of a combined charging and drawing machine; and the Clerk has been authorized to take legal proceedings against the firm for breach of contract. The penalty clause (which the Gas Committee recommended the Council to enforce), it is stated, provides for the forfeiture of £500 for breach of the contract, and for the payment of £2 per day for every day after the limit of time imposed in the contract.

The Pension Question at Oldham.—The suggestion of the General Manager (Mr. Arthur Andrew) that an old-age pension scheme should be instituted in connection with the Oldham Gas and Water Department, which was referred to in last Tuesday's "JOURNAL," has been before the Gas and Water Committee; but consideration of the question has been deferred. The Chairman (Alderman Johnson) said it seemed to him that a scheme should be devised by the whole Corporation, and not one particular Committee; but Mr. Andrew remarked that a start would have to be made somewhere. The Chairman replied that it was a universal question. Mr. Perkins inquired if it was a municipal or a national question. He considered it a national question, and one that ought to be taken up by the Government, which was the proper authority to deal with it. Mr. Wild, on the other hand, thought it was a matter that Trade Unions should consider. Mr. Andrew pointed out that they had men working on the road who were over eighty years of age.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Friday, Jan. 25.

(*Before Justices* DARLING *and* PHILLIMORE.)

Colne Valley Water-Works Company v. Hall.

This was an appeal by the Company from a decision of the Judge of the Watford County Court; and they asked for judgment or for a new trial.

Mr. M'CALL, K.C., and Mr. ROBERTSON (instructed by Messrs. Murray, Hutchins, and Co.) appeared for the appellants; Mr. HORACE AVORY, K.C., and Mr. BARTLEY DENNIS (instructed by Messrs. Fisher and Stephens) represented the respondent.

Mr. M'CALL said the question raised was one of great importance to water companies, and it arose in this way: According to a small plan attached to the Judge's notes, in a road leading from Harrow, called the Northolt Road, there was a main the property of the appellants, and from it there was a pipe leading to a meter. From the meter it went some distance along an occupation lane, and from there into the defendant's premises, East Croft. For a certain distance down this lane the pipe was coloured red, and farther onwards green—the latter portion having been added when the defendant obtained the supply in 1892; and his contention was that the whole of this pipe, until it reached the defendant's house, was a communication pipe. He laid stress upon this, because there were a great many cases in which the distinction had not been borne in mind between a communication-pipe and a service-pipe. The portion of the pipe on which the present dispute arose was that from the main to the meter, which was just off the high road at the mouth of the occupation lane; and the question turned on the property in the pipe between the main and the meter. The Private Act constituting the Company was passed in 1873, and in 1885 they were authorized by another Act to take over the works, rights, and liabilities of the Harrow Water Company, also constituted under a Private Act; and from that time the Colne Valley Company carried on both undertakings—the place in question having been originally part of the Harrow Company's district. The Act of 1873 stated that parties wanting a supply of water must, at their own cost, provide and lay down and maintain all service-pipes and fittings which might be required within their premises, and the Company would lay down and fix the service-pipe to the boundary—all materials and labour being charged to the owner. The learned Counsel went on at great length to cite the various sections of the Private Act, and of the Water-Works Clauses Act, and also passages from the judgments in previous cases, laying special stress on the case of *Milnes v. Corporation of Huddersfield*, which went to the House of Lords, where it was decided that the whole of the communication-pipe, from the main to the consumer's premises, was the property of the consumer.* He submitted that not only was the whole of the pipe in question the property of the defendant, but that in any case he was bound to repair it. The learned Counsel read the correspondence that passed, in which notice was given to the defendant to repair the pipe, with which he did not comply; and ultimately the Company did the work themselves, and brought their action to recover the expense. He also read the Judge's notes and his judgment, in which he held that the pipe was the property of the Water Company, and that they were responsible for repairing it, and could not recover against the defendant.

Mr. AVORY submitted that the County Court Judge was right on both grounds—first, that there was no evidence before him that the piece of pipe which was out of repair was the property of the respondent; and, secondly, that if it was, the liability to repair it was not established either by the Special or the General Act. The action in the County Court was to recover the cost of the repairs which the Company had done; and as to a part of it, the evidence of those who did the repairs showed it was a repair to the plug-cock on the main, as to which it was quite clear that it was not a repair to any communication-pipe so as to come within any of the arguments which had been addressed to their Lordships. With regard to the other portion, which was actually on the bit of pipe between the main and the meter, he contended that no legal obligation on Mr. Hall was established by any of the sections. It was not necessary to argue the general question whether, as a rule, a communication or a service-pipe belonged to the consumer, because the facts of this case were altogether exceptional. It was clear from the facts that the pipe coloured red existed at the time when the Colne Valley Company took over the property of the Harrow Company, and even supposing that, under the old Act, the pipe belonged to some other consumer, as soon as he ceased to take the supply from it, and abandoned any property he ever had in it, the present plaintiffs, when they took over everything that belonged to the Harrow Company, also took over this piece of pipe connected with their main. This was the view that the County Court Judge had taken; but, apart from this, he submitted, and argued at some length, that there was no obligation on the consumer to repair any portion of a pipe which he had no opportunity of inspecting so as to see whether or not it was defective.

Mr. ROBERTSON having shortly replied,

Justice PHILLIMORE delivered the judgment of the Court, as follows: We think that *primâ facie* the property in this pipe, as in all other communication-pipes leading up to the main, would be in the consumer. There may be special facts in this case which would put the property in the Company instead of in the consumer. We do not think it very likely; but if and so far as the judgment of the learned Judge of the County Court rests on that—and it is one of the points he has taken—we think it would be necessary to have the matter further elucidated, and if that were the deciding ground, to have a new trial upon it. We also think that there is nothing in this case in the position of the meter. The pipe *primâ facie* is the consumer's pipe from beginning to end; and it is none the less the consumer's pipe because during some portion of its history the parties changed the ordinary mode of payment for water from assessment on the rateable value to payment by meter, and put a meter in. This would equally be the case in the first instance if the supply were by meter. It might very well be that the Highway Authorities objected to meters under the road, and that in all cases meters cannot be put nearer to the main than the nearest position on some property which is not on the highway. But we think it does not necessarily follow that, supposing the property in this pipe to be in the consumer—and for the purpose of the rest of our judgment we assume it is in him—the consumer is bound to repair it either under the General Act or under the Act of the Company. We think that the principles of the judgments of Lord Esher and Lord Justice Kay in *Chapman v. Fylde Water Company* (1894, 2 Q.B., 599) apply, and that the reasoning is such as we ought to follow, not necessarily regarding it as binding upon us, but taking it as sound reasoning which we ought to follow. We think that the consumer may have a right, and has a right under the Act of Parliament, as against the Highway Authorities, to open the highway once for all for the purpose of making the necessary communication with the main; but the Legislature very reasonably said that after that private individuals were not to be entitled to break up the highway, and that after the pipe had been first laid down the highway can only be broken up by the water company or other body having statutory powers for the supply of water in the district. This being the case, we think the consumer has not the power—he certainly has not got it expressly, and we do not think he has it by implication—to break up the road, either for the purpose of repair or for the preliminary purpose of inspection, to see whether or not the pipe is defective. We think that, this being the case, the only body which can open the highway is the water company, and that in the rare instances—because they will be rare—in which the portion of the pipe from the main to the edge of the highway gets out of repair, the duty of repairing that would naturally fall on the water company. We do not decide this case upon the ground suggested by Mr. Avory, that everything outside the consumer's premises must be repaired by the water company. We leave entirely open the question of what would happen with regard to the portion of the pipe which passes through the property of third persons—either closes or occupation roads; but with regard to the portion of the communication-pipe which passes under the public highway, we think that, inasmuch as the appellant Water Company alone have the right to break up the highway for the purpose of either repair or inspection, they, and they alone, are bound to repair, and that they, and they alone, must bear the cost of repair. There are strong points in support of this under the General Act, and a different point, equally strong, in favour of that contention under the Special Act. Under the General Act, the liability on the consumer, if there is one, does not depend upon notice. He is liable though he has no notice, and he is liable for that which not only he does not know, but which he cannot know because he cannot open the ground; and it would be an extremely strong view to infer that such a liability existed. Under the Special Act, it is quite true he is only liable after notice; but then we think that such a notice could not be given in respect of the piece of ground in question. The notice can only be given when the occupier "shall have permitted;" and we accept the argument that a man cannot be said to have permitted that which he could in no sense have prevented. Therefore, upon these grounds, we think that the learned County Court Judge was right in saying not that a piece of pipe which is outside the occupier's premises is necessarily repairable by the Company, but that the particular piece of pipe in question, which was entirely under the roadway, was a part which the Company must repair at their own cost. That is really the only contention raised on behalf of the occupier. The language of the learned County Court Judge, if it was intended to apply to anything more than the case before him, might have raised a very serious point—whether the whole of the pipe going down the occupation road was repairable by the Company or by the consumer. Our judgment does not touch that question. Personally, I may say for myself that I think the limit is not the consumer's premises but the public highway. At any rate, all that we decide to-day is that, as regards this piece of pipe which is under the public highway, there is no responsibility on the part of the owner to keep it in repair. Therefore the judgment in the Court below must be affirmed, and the appeal dismissed.

Mr. M'CALL asked leave to appeal.

Justice DARLING granted it.

Mr. AVORY pointed out that the appeal might mean an enormous sum to Mr. Hall, who, he said, was not interested in fighting the battle of the public; and he thought terms should be imposed on the Company if they wished to make this a test case.

* See "JOURNAL," Vol. XL., pp. 264, 1089, 1127: Vol. XLII., p. 887; XLVII., 496; and Vol. XLVIII., p. 107.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Jan. 24.

(*Before the* LORD CHIEF JUSTICE *and a Special Jury.*)

English v. Metropolitan Water Board.

This was an action brought by Lieut.-Col. English, a retired officer of the Royal Engineers, who in 1874 purchased a property at Hawley, near Dartford, in Kent, called "The Rookery;" and he asked for an injunction to restrain the defendants from polluting a stream which formed the boundary to one of his fields, by allowing refuse water, oil, and grease from their steam-engines and boilers to flow into it, and from unlawfully abstracting water from the stream. He also claimed damages for the injury already done.

Mr. TINDAL ATKINSON, K.C., Mr. FITZGERALD, K.C., and Mr. BAILHACHE (instructed by Messrs. Deacon, Gibson, Medcalf, and Marriott) appeared for the plaintiff; Mr. ELDON BANKES, K.C., and Mr. A. B. SHAW (instructed by Mr. Walter Moore) represented the defendants.

Mr. TINDAL ATKINSON said the defendants were successors of the Kent Water Company, who at the time the dispute arose had sunk a well and erected a pumping-station close by the stream in question,

which up to that time was a clear brook, running over a gravel bed, fed by springs in the chalk, was hardly ever dry, and ultimately found its way into the Darent. In fact, the river was the spawning-ground and breeding-place for the trout for which it was famous. The Kent Company sunk a well to the depth of 100 feet, and put down a borehole for another 130 feet; and the chalk brought up by these operations was allowed to pass into the stream, raising the bed about 18 inches—covering the gravel, making it unfit for trout, and forming a dam which diverted the stream. In addition, the pumping operations had the effect of abstracting the water from the stream to such an extent that it was often left practically dry; while the small quantity of water which was left in puddles was so polluted by the dirty, greasy water from the engines, that cattle would not drink it. The defendants took over the property from the Kent Company in 1904, and the pollution and abstraction of water went on, notwithstanding repeated complaints, until some time in 1906, when certain tanks and soakage pits were constructed. But the evidence would show that they were quite ineffective. With regard to the abstraction of the water, he admitted that if the defendants had simply tapped the springs in the chalk, and so prevented the water rising into the brook, the plaintiff, though he would have been injured, would have had no remedy. But if the water once reached a defined channel on the surface, then no one had a right to divert or abstract it to the detriment of anyone having riparian rights in the neighbourhood. That this was the case here would, he thought, be made quite clear, among other things, from the fact that when, in consequence of some accident, the pumping operations of the defendants were suspended for a time, the stream rose within 48 hours to its old level, and followed its original course. Steps were then taken to ascertain whether there was any loss of water in the channel from the place where the stream entered the defendants' premises to the point where it left; and there was no loss whatever, though up to that time, by tests taken, from one-half to two-thirds of the water had disappeared between the two points, and it was manifest that this could only occur in consequence of the pumps drawing it off through the underground porous strata. The question could be tested at any time by stopping the pumping operations. Counsel then proceeded to read the correspondence which passed prior to the action—beginning in March, 1905, with a letter from the Secretary of the Darenth Fishing Preservation Society, and continuing at intervals for about a year; the writ being ultimately served on March 17 last year. The principal case relied on with regard to the right to take water from a running stream was *Sugar v. Grand Junction Canal Company* (6 Ch.).

Friday, Jan. 25.

On the resumption of the case this morning,

Plaintiff was called, and his evidence, in which he went into all the circumstances in great detail, occupied the greater part of the day.

Colonel *Dale* was the next witness; he being a neighbour of the plaintiff.

The examination-in-chief of this witness had not concluded at the rising of the Court, when the case was adjourned to the 28th inst. (yesterday).

Liability of an Agent for Water-Rate.

Out of 117 claims for rates brought by the Metropolitan Water Board in the Westminster County Court on Monday last week, only one was disputed before his Honour Judge Woodfall. The question was whether the defendant, Mr. Letchford, a solicitor, who employed a collector, was liable for water-rate, or whether it was the collector, as the defendant contended. Mr. D. Collins, the Assistant-Solicitor to the Board, said the defendant was the nephew of the owner of property in the East London district, and acted for his uncle. He employed a collector, at 5 per cent. commission on the rents collected. The rateable value of the premises was under £20, and the East London Water Act contained a clause similar to one in the Water-Works Clauses Act which stated that in such cases the owners instead of the occupiers should be liable for the rate. He referred to the Act to show that an agent was liable in the East London district. The defendant contended that the "agent" in this case was the man who collected the rents. His Honour said he thought the defendant was liable; his case being the very one contemplated by the Act. The plaintiffs must therefore have judgment for the amount claimed, with costs.

Method of Charging for Water.

An action was brought in the Torrington County Court yesterday week, to test the legality of the charges made by the Corporation for water supplies. The defendant was a butcher named Slee; and the amount in dispute was £1 5s. 5d. It was stated that defendant was formerly a member of the Town Council; and it was alleged that, on paying the water-rate at Midsummer last, he told the collector that if he was defeated in November he should raise the question of the method of charging for water. The demand-note stated the charges to be for domestic supplies 1s. 2d. in the pound on the gross rateable value; for fields, 10d. in the pound; and for other items, such as baths, slaughter-houses, &c., at varying amounts. The question was whether the Town Council, who acquired the water undertaking in 1900, had a right to charge on the gross rateable value. Mr. Hopper, for the Corporation, admitted that if the case came under the portion of section 56 of the Public Health Act, 1875, which said local authorities may charge "a water-rate to be assessed on the net annual value of the premises," he was "out of court." But the section went on to provide that local authorities "may enter into agreements for supplying water on such terms as may be agreed on between them and the persons receiving the supply;" and he submitted that where a man took goods, that constituted on his part an agreement to pay for them. As Mr. Slee had for years past used the water and paid the charges, and in this particular quarter he took the water and gave no notice, Mr. Hopper contended that there was abundant evidence of an agreement on defendant's part to pay for it, as he had hitherto done. Mr. James, for the defendant, argued that there was a difference between a constructive agreement in the case of private individuals and one in which a body like the Corporation, acting under statutory powers, were concerned. Defendant was entitled to be assessed on the net annual value, in the absence of an agreement; and taking the water did not constitute an agreement. Defendant, who was called, said he had protested against the charge for eighteen months; but he had never given notice to the Corporation that he should discontinue taking their water, and had used it for the slaughter-house, carriage, and other purposes. His Honour Judge Beresford held that the Corporation came under the section, and that they could only assess the water-rate on the net value. The provision as to agreements did not apply, because no agreement had been entered into between the Corporation and the defendant. On the grounds that the rate had been wrong from first to last, and defendant had been fighting the case, not only for his benefit, but for the benefit of the public, his Honour allowed costs on the higher scale.

Gas Companies and Forged Cheques.

At Old Street Police Court, last Wednesday, a curious point was raised as to the liability of a gas company to refund money paid under the peculiar circumstances stated below. A man named Hartley, an accountant, was in the dock charged on a warrant with having forged and uttered a cheque for £27 12s. Mr. A. E. Robinson, who prosecuted, stated that, among other charges it was intended to prefer, were some in respect of two cheques which had been paid to the Gaslight and Coke Company for gas supplied to—it was believed—prisoner's own household. Hartley had been employed as clerk-accountant by a firm of tapestry merchants in Wells Street; and in this position he had full access to the cheque-book, pass-book, paying-in book, &c. He was discharged from his employment in October; and subsequently a communication to the firm led the latter to put a private mark on all cheques sent out. No others were to be cashed by the bank with which the firm kept their account. The cheque for £27 12s.—the subject of the charge—was presented about the end of December, and returned by the bank. Then an investigation showed that cheques had been removed from the firm's books, and (on forged signatures of the two partners) had been paid through the bank. They could not be traced; and it was presumed that the prisoner had destroyed them, and taken other steps to hide any account to which they might refer. Among these cheques were two, Mr. Robinson said, traced to the Gaslight and Coke Company, as having been received for quarterly accounts for gas. He should contend that the Company were liable to refund the money; and he proposed to take a subpœna *duces tecum* to compel the Company to produce their books, and, as the cheques could not be found, get the only available information from them. The point thus raised will no doubt be referred to again next week, when the prisoner comes up on remand.

Gas v. Electricity in Birkdale.

The Southport Corporation and the Birkdale Urban District Council are each endeavouring to convince the ratepayers of Ainsdale, which last year became a ward in Birkdale, of the respective merits of gas and electricity for lighting purposes. Birkdale is electrically lighted by the District Electric Supply Company; and Ainsdale, as well as Birkdale, is supplied with gas by the Southport Corporation through Birkdale mains. Recently the Birkdale Council decided to ascertain whether the Ainsdale ratepayers would prefer electricity to gas; and they caused a poll to be taken on the point. The Southport Gas Committee resented what they regarded as an attempt by Birkdale to promote the interests of a private Company at the expense of the Corporation estate; so they furnished the Ainsdale ratepayers with circulars showing the cheapness and superior illuminating power of gas as compared with electricity. The Birkdale Council deny that they are seeking the advantage of a private Company. One of their officials has announced that, though figures are not available, the Council are highly satisfied with the result of the poll, and that "there is a certainty of electricity being taken to Ainsdale when the Council are ready to proceed." Despite this declaration, the Southport Gas Committee view with complacency any scheme which may be mooted in this direction, because lively opposition has been aroused to the introduction of electricity.

London County Council Testing of Electricity-Meters.

The London County Council have laid down new rules and a scale of fees to be charged for the testing of electricity-meters. One of the rules is as follows: "In the case of meters which before being fixed shall have been tested by the Council and passed as correct, the meters will be tested for starting current and at one or more quarter loads; and if the results be approximately the same as those obtained in the previous tests, the meters will be considered correct. A meter shall be considered by the inspector to be correct if, being intended for currents not exceeding 3 amperes, the error at one-tenth of its full load and above this point does not exceed + or − 3½ per cent.; exceeding 3 amperes but not exceeding 50 amperes, the error at one-tenth of its full load and above this point does not exceed + or − 2½ per cent.; and exceeding 50 amperes, the error at one-twentieth of its full load and above this point does not exceed + or − 2½ per cent." It is specified that in the case of meters which have not been tested and sealed by the Council before fixing, the tests will be made at the average load used by the consumer, if this can be ascertained, except that in the case of meters intended for currents not exceeding 3 amperes, the tests will be made at one-quarter and three-quarters of the consumer's maximum installed load. The fees for testing single or disputed meters range from 10s. up to 20,000 watts capacity, to £2 10s.; rising by 10s. for each 20,000 watts.

The quarter's account for electricity consumed at the Acton Public Library was stated at last Tuesday's Committee meeting to be practically double the amount paid when gas was used.

MISCELLANEOUS NEWS.

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 270.]

The accounts of the Company for the six months ending Dec. 31, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. Deducting the amount redeemed, £40,090, the total amount of the Company's existing capital powers is £21,602,975. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807 11s. 9d.) to the amount of £27,513,757 11s. 9d. The expenditure is shown in the following items:—

Expenditure to June 30, 1906		£13,389,124 19 11
Expenditure during the half year to Dec. 31, 1906—viz.,		
On land	£11 4 3	
Buildings and machinery in extension of works	4,323 2 7	
New and additional mains and service-pipes	14,904 7 11	
Do. do. meters	28,186 12 1	
Do. do. stoves	22,076 8 5	
		69,501 15 3
Total expenditure		£13,458,626 15 2
Nominal amount added on conversion		13,656,540 0 0
		£27,115,166 15 2
Deduct amount of capital redeemed under Company's Act of 1903		40,090 0 0
		£27,075,076 15 2
Balance of capital account		438,680 16 7
		£27,513,757 11 9

The balance applicable to the redemption fund and to dividend on the ordinary stock is £574,421 8s. 4d.; and the following statement shows how it is proposed to appropriate it.

Dec., 1905.		
£217,408	Net balance brought from last account	£210,481 3 9
308,802	Net revenue for the half year	363,940 4 7
£526,210		£574,421 8 4
10,000	Contribution to redemption fund	10,000 0 0
(£4 8s. per cent.)	Dividend on the ordinary stock—	
£334,911	£4 8s. per cent. per annum on £15,203,110	334,468 8 5
£181,299	Balance carried to next account	£229,952 19 11

The following is the revenue account:—

Expenditure.

Dec. Half Year, 1905.		£ s. d.	£ s. d.
	Manufacture of gas—		
£48..631	Coal into store	491,0 5 0 5	
85,151	Oil ,, less value of oil tar	7.,027 5 [illegible]	
27,4[illegible]2	Coke and breeze used in the manufacture of carburetted water gas	31,012 16 0	
15,047	Salaries of Engineers and other officers	14,885 15 4	
109,015	Wages, gas making £90,492 10s. 0d.	104,984 3 4	
17,478	,, sundries £14,491 13s. 4d.		
41,634	Purification, including £12,767 2s. 4d. for labour	27,300 14 [illegible]	
183,918	Repair and maintenance of works and plant, materials and labour, less received for old materials, £7687 16s. 0d	181,483 14 11	
	Distribution of gas—		928,309 10 4
41,261	Salaries and wages of officers (including Rental Clerks)	42,091 5 1	
59,430	Repair and maintenance of mains and service-pipes, &c.	69,998 13 10	
26,028	Repair and renewal of meters	27,173 17 5	
56,483	,, ,, stoves	45,420 10 11	
			184,684 7 3
18,341	Public lamps—lighting and repairing	..	19,401 7 8
	Rents, rates, and taxes—		
5,842	Rents payable	5,823 12 9	
148,824	Rates and taxes	136,742 19 [illegible]	
	Management—		142,566 12 6
2,750	Directors' allowance	2,750 0 0	
217	Company's Auditors and Assistant	200 0 0	
	Salaries of General Manager, Secretary, Accountant, and clerks	7,782 10 [illegible]	
7,516	Collectors and Cashiers	22,620 2 11	
24,555	Stationery and printing	5,311 11 [illegible]	
5,423	General charges	4,733 13 8	
3,527			43,397 18 5
1,629	Parliamentary charges	..	..
993	Law charges	..	1,055 17 6
1,388	Charges *re* quinquennial re-valuations	..	..
4,937	Bad debts	..	5,223 0 3
500	Depreciation fund for works on leasehold lands	..	500 0 0
	Annuities, including contribution to		
23,773	officers' superannuation fund	..	24,564 9 11
648	Workmen's compensation account	..	1,227 4 4
	Public officers—		
849	Gas Referees and Official Auditor	847 7 0	
632	Public testing-stations	999 18 0	
			1,847 5 0
£1,380,302			1,352,777 13 2
503,848	Balance carried to net revenue account		561,209 13 1
£1,884,150			1,913,987 6 3

Receipts.

Dec. Half Year, 1905.		£ s. d.	£ s. d.
	Sale of gas—		
£1,434,952	Per meter, at 2s. 11d. and 2s. 2d. per 1000 cubic feet	1,442,784 4 9	
68,970	Public lighting and under contracts	69,491 8 7	
			1,512,275 13 4
£1,503,922			
36,215	Rental of stoves	..	38,103 8 10
	Residual products—		
£203,220	Coke, less £32,023 16s. 9d. for labour, &c.	218,187 11 10	
14,233	Breeze, less £4241 5s. 10d. for ditto	12,093 16 2	
40,406	Tar and tar products	48,487 16 7	
81,240	Ammoniacal liquor and sulphate of ammonia	80,026 14 2	
			358,795 18 9
£339,079			
£4,641	Rents receivable		4,537 2 10
293	Transfer fees		275 2 6
£1,884,150			1,913,987 6 3

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £62,304 2s. 10d.; insurance fund, £90,442 2s. 5d.; and depreciation fund, £63,296 14s. 10d.

The following statements relate to the working:—

Statement of Coals Used, &c.

Description of Coal.	In Store June 30, 1905.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1906.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	132,919	899,037	805,473	1,743	224,740
Cannel	12,936	..	900	..	12,036
Total	145,855	899,037	*806,373	1,743	236,776

* In addition to this quantity of coal, 7,300,963 gallons of oil and 69,115 gallons of spirit were used during the half year.

Statement of Residual Products.

Description.	In Store June 30, 1906.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1906.
Coke—tons	10,498	504,548	102,494	395,174	17,378
Breeze—tons	11,927	68,266	13,428	64,462	2,303
Tar, from coal only—galls.	631,461	8,107,645	7,884,447	15,720	838,939
Ammoniacal liquor—butts	18,315	233,232	229,784	..	21,763

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*11,288,134	472,670	10,211,254	10,803,847	49,596
†11,236,107	472,140	10,095,388	10,695,531	49,736

* Including 2,542,181,000 cubic feet of carburetted water gas. † Dec. half year, 1905.

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £155,365; oil and petroleum spirit, £34,023; coke, £10,155; tar and ammoniacal liquor and products, £117,423; and sundries, £221,839. The figures this time last year were: Coal, £139,471; oil and petroleum spirit, £44,636; coke, £4485; tar and ammoniacal liquor and products, £86,518; and sundries, £231,175.

BATH AND THE SULPHUR QUESTION.

In presenting a report to the Bath Town Council on the Removal of Sulphur Restrictions Bill, 1907, which is being promoted by the Bath and other Gas Companies, the General Purposes Committee stated that, being satisfied (after reading reports by the Town Clerk, the Borough Analyst, and the Medical Officer of Health) that opposition to the Bill was not likely to be of any use, they could not recommend the Council to take any steps in the matter.

When the report came before the Council, the Chairman (Mr. J. W. Knight) asked the City Analyst (Mr. J. W. Gatehouse) if he could give any explanation with reference to his report on the subject. Mr. Gatehouse replied that, so far as he could understand it—and he was not quite certain he did understand the whole effect of it—the application of the Company was that they should not be compelled to extract any sulphur from their gas other than that which was present in the form of sulphuretted hydrogen. The Gas Act under which the Company at present worked permitted them, he believed, to retain as much as 30 grains of sulphur per 100 cubic feet, which was by no means, in his estimation, non-prejudicial. He could not imagine that they would get any worse results than they were obtaining at the present time; but he thought the Company should have been compelled years ago to have taken out far more than they did, for the benefit of the consumer. In answering Alderman Mitchell, as to whether the colour of the gas would be improved, Mr. Gatehouse said

gas was not now manufactured in the same way as when the Bath Gas Acts were passed. Now they not only used coal, but oil also. In the present day, not merely in Bath, but all over the country, there was a great deal more carbon monoxide in gas than formerly; and carbon monoxide was a very deadly poison. Any person could very easily commit suicide by taking gas as it came from the mains and breathing it. He could only suggest that it would be very desirable if the amount of carbon monoxide could be limited.

The Chairman said he thought it would be very advisable, in the light of these statements, that the matter should be considered in consultation with Mr. Gatehouse and the Medical Officer of Health; and this was agreed to.

TESTING BIRMINGHAM GAS IN KING'S NORTON.

The Birmingham Gas Committee, in a report which will be submitted to the next meeting of the City Council, point out that the King's Norton and Northfield Urban District Council are promoting a Bill, clause 212 of which reads as follows:—

(1) The Council may cause to be provided at such place or places within the district as they shall deem most convenient for the purpose a testing place or places, with apparatus therein, for the purpose of making the following tests of the gas supplied within the district by the Corporation of Birmingham, or any other body of persons for the time being empowered to supply gas within the district (in this section referred to as the undertakers). That is to say: (*a*) For testing the illuminating power of the gas supplied; (*b*) for testing the presence of sulphuretted hydrogen in the gas supplied.

(2) Any gas examiner appointed by the Council in pursuance of the Gas-Works Clauses Act, 1871, may carry out the tests provided by the said Act at any place provided by the Council for that purpose under this section; and any such test there and then made by the gas examiner, and his report of the results of his testing, shall be receivable in evidence in the same manner, and shall be of the same effect in all respects, as if such test had been made at the place provided by the undertakers in pursuance of the said Act.

The Committee remark that the districts of King's Norton and Northfield are within the area supplied with gas by the Corporation. Under section 28 of the Gas-Works Clauses Act, 1871, and section 156 of the Birmingham Corporation (Consolidation) Act, 1883, the Corporation have to provide a testing-place for testing gas at each of their gas-works. By section 29 of the Act of 1871, the local authority of any district where the gas is not supplied by such local authority may from time to time appoint, and may appoint and keep appointed, a competent and impartial person to be a gas examiner, to test the gas at the testing-place provided in conformity with the provisions of the Act; and such gas examiner may there test the illuminating power and purity of the gas supplied by the Corporation any day between the hours of 5 o'clock and 10 o'clock in the afternoon from Oct. 1 to March 31, and on any day between the hours of 8 o'clock and 11 o'clock in the afternoon from April 1 to Sept. 30. The King's Norton and Northfield Urban District Council, by their Bill, seek power to provide a testing place or places within their district; and, after careful consideration, the Committee are of opinion that the Bill should be petitioned against and opposed in Parliament.

The Committee therefore recommend that the Town Clerk be authorized to petition against the Bill.

SWADLINCOTE GAS SUPPLY.

A Special Meeting of the Swadlincote Urban District Council was held last Tuesday—Mr. B. Goodhead, J.P., presiding—when Alderman Hart, of Derby, who had been engaged to audit the accounts for the year ending March 31 last, was present, as also was Mr. J. Ferguson Bell, the Manager of the Derby Gas-Works, to explain the report which, as has already been stated in the "JOURNAL," he was asked to prepare in regard to the accounts. In his report, Alderman Hart, after adjusting the stocks, brought out a balance of profit (to be devoted to the free-fittings system) of £971.

In his report last week, Alderman Hart said that, in consequence of the way in which the accounts were made up, it was difficult to ascertain the profit actually earned during the year under review, as the cash transactions were taken and the stocks valued at the commencement and the end of the year, instead of a revenue account being prepared with allowances made for difference in stocks, when the value of stocks held would be shown in a general balance-sheet. He strongly recommended the Committee to alter the system of keeping the gas accounts, and bring them into conformity with the style prescribed by the Gas-Works Clauses Act of 1871; so that the annual statement might, in future, correspond with the Model Schedules. The outstanding loans on capital expenditure amounted to £64,743, upon a total sale of gas of 35 million cubic feet, or nearly £1850 per million—a sum far in excess of what was generally considered a moderate capital even for small gas undertakings. The average capital employed per million feet of gas sold (according to the last published returns in "Field's Analysis") of nine large corporation gas undertakings was £555, which was less than one-third of that employed at the Swadlincote Gas-Works; and if allowance was made for the concern being much smaller, it was evident that the undertaking was over-capitalized, which compelled him to recommend that all expenditure should as far as possible be charged to revenue. The interest charges of £1972 and repayments on capital accounts of £1081, totalled £3053 for the year, which was equal to 1s. 9d. per 1000 cubic feet of gas sold. This proved that if gas was to be sold cheap, it would be necessary to reduce the heavy capital charges.

Mr. Stevens moved the adoption of the report, and wished to know whether the sum of £1800 advanced out of the rates should be treated as a loan to the gas accounts. Mr. Howard seconded, and stated that the Council were supplying gas to large consumers at 3s. 6d. per 1000 cubic feet, which cost 3s. 6½d. to make. Mr. Wragg was of the opinion that the capital account should be reduced and the quality of gas improved to meet the requirements of the district. Mr. Bell recommended that boiling-burners should be fixed in houses where cookers were in use, which would increase the consumption of gas. The Clerk stated that the Council had taken a loan of £3000, repayable in ten years, for mains and extensions, and that they had an overdraft of £2000 for free fittings, which would have to be paid. Alderman Hart suggested that it should be augmented to £5000. Mr. Wragg strongly objected, and said it was useless to take up a loan of £10,000 for ten years, as the money would have to come out of the rates. Mr. Stevens said the outlook did not warrant any further expenditure, as the income per slot meter, which in 1905 averaged £2 0s. 8d., had fallen to £1 17s. 10d. in 1906, and the sale of gas had gone down 100,000 cubic feet. Alderman Hart reminded the Council that in case another loan was wanted it had better be taken for five years and repaid annually from the profits. Mr. Wragg maintained that no profits had been made, and no money was available from that source.

Mr. Belfitt, the Chairman of the Lighting Committee (who announced his intention to resign), said, in reply, that the report was a plain and sensible one, and must be the basis for the management of the gas-works. But he was interrupted with the remark that it did not show any profit. Continuing, he said, if there were no profits, where did the stock come from? Mr. Underhill: It has come from the overdraft. The Chairman pointed out that a man should be kept to look after the leakages. With respect to the income, he was pleased to know that 1000 houses were using slot meters, and to increase the consumption an outlay of £3000 was wanted to connect as many more houses in other parts of the district.

The report was adopted; and in responding to a vote of thanks, Alderman Hart said that, though the gas-works had a burden of £65,000, he was confident that, with the enlargements now completed and the extension of the free-fittings system, the Council would have no cause to be disheartened.

A TALK ON GAS MATTERS TO WORKING MEN.

At the Lyndhurst Hall, Kentish Town, last Tuesday, a large number of working men assembled to hear a "talk" by Mr. Ede on "Coal Gas: Its Rise and Development, and Its Uses." A short time since a "talk" had been given to the men on electricity; and it was thought only fitting that the benefits of the "rival illuminant" should be expounded to the members of the Institute.

Mr. Ede commenced with the introduction of gas more than a hundred years since, and the early experiments of Murdoch in 1791–2. He said that in 1807 gas was used as an illuminant in London for the first time; and companies were formed for its manufacture. The retorts were vertical cast-iron cylinders, filled with coal and heated to redness in a furnace. The ascending vapour passed through a trough of water (which, to a certain extent, freed the gas from both tar and ammonia), and was eventually collected in holders some distance away. It was not long before improvements were made, which resulted not only in a better quality, but a greater yield, of gas. These improvements in the retorts went on until a fairly definite candle power could be obtained, and the success of the "new illuminant" was assured. Chemists then began to interest themselves, and were not long in discovering that gas made from other substances could be used for illuminating purposes—such as from wood pulp, and even from sewage. But as the chemists had not another Murdoch to make their appliances for manufacturing these gases, they were, after a time, dropped. In 1810, in London, the Chartered (or Gaslight and Coke Company) was formed to supply the City and Westminster, the Phœnix (or South London Company) in 1816, the City of London Company in 1817, the Imperial Company in 1820, the Ratcliffe Company in 1823, and the Independent Gaslight and Coke Company in 1829. Between the latter date and 1835, a number of other Companies came into being—the London Company in 1830, and the South Metropolitan Company in 1833, both on the south side of the Thames—and a certain amount of free competition existed. In 1823, the selling price of gas was 15s. per 1000 cubic feet, which was gradually reduced to 13s. 6d. in 1830, to 12s. 6d. in 1832, to 10s. in 1836, and to 4s. in 1853, owing to competition. The Companies, however, came to their senses, from a "self-preservation" point of view, and made agreements with each other. They thus created a practical monopoly, and raised the price of gas to 6s. per 1000 feet. This continued about thirteen years.

During this period, an agitation was started by Mr. Charles Pearson, the City Solicitor of that day, and Mr. John Thwaites, a draper of the Borough (who afterwards became Sir John Thwaites), the result of which was the immediate starting in South London by Mr. Thwaites of the Surrey Consumers' Gas Company, and in the City of the Great Central Consumers' Company by Mr. Pearson. Both Companies were to supply at 4s. per 1000 cubic feet. The result of this was that the other Companies had to lower their prices to 4s. In the City, the Great Central Consumers' Company secured the contract for lighting the streets in 1850, and saved the citizens £730 in that year, but not without inconveniencing the public by the opening of 1650 holes in the streets. Agreements to divide the Metropolis into districts, to prevent competition, were sanctioned in 1860 by the Metropolis Gas Act; the result being that the price again advanced to 4s. 6d. But this Act, which gave so much to the Gas Companies, laid down a principle which is in force to-day—that Gas Referees should be appointed, with stringent powers relating to the testing of the gas. Two very important Acts were passed in 1868—one called the Gaslight and Coke Company's Act, and the other the City of London Gas Act. The former enabled the Chartered Company of 1810 to annul its Charter, and enabled various amalgamations to take place; the result being that the Imperial Company's price was fixed at 3s. 9d. per 1000 feet, the South Metropolitan Company's at 3s. 6d., the Gaslight and Coke

Company's at 4s., and the Commercial Company's at 4s.—with power of appeal to the Board of Trade for an alteration. In 1876, the sliding-scale was introduced.

The speaker closed his brief account of the Metropolitan gas supply by a few words upon the gas undertakings in the United Kingdom at the beginning of the present century. There were then 661 authorized gas undertakings, using 13 million tons of coal annually, and producing some 140 thousand million feet of gas, with an authorized capital of £83,000,000, the market value of which was something like £200,000,000. Of these 661 undertakings, 222 belonged to local authorities. There were also over 1000 non-statutory undertakings, of which they had no accurate knowledge. Figures like these told their own tale, and showed not only the enormous development of gas engineering enterprise, but its widespread and national importance.

Mr. Ede then gave a very graphic description of a testing-place, setting out and explaining the various means used for testing gas for impurities and illuminating effect. He afterwards dealt with residuals, and gave directions for reading a meter, and hints on pressure, governors for burners, and the use of bye-passes. After some remarks on incandescent lighting, the speaker said he thought finality had been reached in mantles, and improvements must now be sought for in burners. He described various burners, and said great harm was being done to incandescent gas lighting by the many cheap burners now on the market, owing to the expiration of the Welsbach patents. Better results could be obtained from the old type of Welsbach "York" or "C" burner than from many of the modern burners; and if consumers would pay a good price for a thoroughly good burner, they would find it the cheapest in the end.

At the close of the "talk," time was allowed for questions; and in the course of his reply, Mr. Ede said he was indebted to Mr. W. J. Liberty for the historical portions of the paper relating to the London Companies.

GAS SUPPLY IN JAPAN.

Osaka Gas Company.

In the "JOURNAL" for the 25th ult., we gave a short history of the gas-works of the city of Yokohama, which were the first of the kind in Japan. From the last number to hand of the "American Gaslight Journal," we take the following particulars in regard to the Osaka Gas Company, which is believed to be the first public service company in that country to be controlled by a foreigner.

Osaka is variously referred to as the Liverpool, Manchester, and Venice of Japan; and the scheme to establish gas-works there was originally suggested by Mr. Alexander Tison, a New York gentleman, and at one time a professor in the Tokyo University, to Mr. A. N. Brady, the American capitalist. In 1901, Mr. Brady, with Mr. Carroll Miller, who at present holds office as First Vice-President and Chief Engineer of the Company, made their first visit to Japan in connection with the project, though the matter had been under consideration since 1896. The following year (1902), active operations were commenced; the controlling interest having passed into Mr. Brady's hands, and the capital increased to 4,000,000 yen. For the next two years the construction and main-laying work went steadily forward; and finally, in October, 1905, the supply of gas was turned on. The plant at present in use has a capacity of 1 million cubic feet per day; but the demand has quickly outgrown the original estimate of the founders, and steps are now being taken to increase the output of the works. Only coal gas is produced. The manufacturing plant consists of full-depth regenerative furnaces with horizontal retorts of the most modern design, and the other plant and appliances are also of the latest and most improved type. At the commencement of this year the Company had more than 50 miles of mains running through the streets; and they are being rapidly increased. The apparatus and materials were purchased in various countries. The majority of the cast-iron piping came from America; the works apparatus from Germany; and the consumers' meters, wrought-iron piping, &c., from the United States. The building material and some of the cast-iron pipes were bought in Japan; and the greater part of the fittings and appliances sold by the Company have, up to the present, been of Japanese make. The Company possess a very enterprising directorate and Chief Engineer; and in their offices, which are located in a building such as one would expect to see in a European city, they have on view some of the most up-to-date systems of gas lighting. The result has been that the undertaking has developed in a remarkable way since operations were commenced.

METROPOLIS WATER SUPPLY.

London County Council and the Water Board's Bills.

At the Meeting of the London County Council to-day, the Parliamentary Committee will present a report on the subject of the Bill promoted by the Metropolitan Water Board to establish a uniform scale of charges for water applicable throughout the Board's area of supply, of which an epitome appears in another part of the "JOURNAL" to-day. The Committee explain that section 15 of the Metropolis Water Act, 1902, provides that the Board shall introduce a Bill for the purpose named within three years from June 24, 1904. The main proposal of the Bill is that there shall be a single uniform rate of 5 per cent. on all values to cover the whole of the domestic supply, and that no charges for extras shall be made except for garden watering. The Bill also proposes that the basis of the charge for domestic supplies shall in future be the rateable value of any house as appearing in the valuation list. At the present time, this is the basis in the County of London, as the result of the Water-Rate Definition Act, 1885. In the extra-London district, rateable value is not the basis, but the annual value, under the provisions of the Water-Works Clauses Act, 1847. This figure—*i.e.*, the annual value—is, as a rule, higher than the rateable value appearing in the valuation lists, as, owing to there being no periodical re-valuation in these districts as there is in London, the assessment very frequently falls below what it would be if periodically re-valued according to the London scale. The present practice of charging water-rates, therefore, is in the direction of equality between London and the extra-London district; but if the proposal of the Bill is adopted, it will have the effect of transferring some part of the burden from the extra-London district to London. The Committee point out that this would intensify any existing inequality. There are other important questions raised in the Bill which require consideration. They have accordingly appointed a Sub-Committee to consider its provisions, who will report to the Committee in due course. In the meantime, having regard to the inequality that must arise in consequence of the proposed alteration in the basis of charge as between London and the extra-London districts, they think the Council should lodge a petition against the Bill, not from the point of view of objecting to the main proposal, but in order to call attention to this inequality, with the view of having the Bill amended. The Water Board's estimate of the loss by the reduction of the basis of assessment is upwards of £10,000 per annum. This figure, however, would be considerably increased if the Board had fully exercised their existing powers to revise the charges in the extra-London district. The Committee recommend that petitions be sealed and presented against the Metropolitan Water Board (Charges, &c.) Bill, and the Metropolitan Water Board (Various Powers) Bill.

VIENNA WATER SUPPLY.

Frequent references have been made to the above subject in the Engineering Supplement to "The Times;" and in a recent issue some further particulars were furnished from the local correspondent of that paper, who obtained his information from a report made by the Municipal Inspector (Herr Bodenschor) on the mode of apportioning among the various areas the water derived from the new high-level service named after the Emperor Franz Josef. It appears that the total supply is estimated at 74·33 million gallons daily; being 30·33 million gallons from the one branch of the service and 44 million gallons from the other. Taking a daily volume of 22 gallons per head, the supply of water would suffice for a population of 3,380,000 inhabitants; and, according to statistical estimates, the population of Vienna would reach this total in the year 1940. It may, therefore, be assumed that the present works will suffice for the needs of Vienna until that date. Calculations as to the density of the population in the separate quarters of the city lead to the conclusion that in the parts now supplied, having an area of about 28,047 acres, a volume of some 70,840,000 gallons will be required in 1940; leaving the balance of 3,520,000 gallons available for certain high-lying districts of the city, which have at present no supply, and the area of which amounts to about 3460 acres.

Since it is not at present practicable to arrange fully for future requirements, it will be necessary later to construct two new reservoirs supplementary to those now in use. In the new quarters of the city to be added eventually, there will be a division into two zones—a high-level area and the summit-level area. The first will comprise in all a surface of about 2051 acres, and the latter an area of about 1409 acres. It will be possible in the former district to supply water by gravitation up to a height of 984 feet above sea level, while the rest of the water must be pumped. In consequence of the peculiar contours of the summit zone, it was found necessary to divide it up into several minor areas, and to provide three reservoirs at levels of 1040, 974, and 958 feet respectively above datum. It is proposed later to construct six smaller reservoirs at levels of 1312, 1247, 1345, 1312, 1214, and 1640 feet respectively. The new conduit, or the second Franz Josef supply, as it is termed, will be united to the district to be served by means of two mains. One of these, after passing a regulating chamber, to remove the pressure, will be joined to the existing mains, and the second will be reserved for the two highest zones. The new scheme provides in all for eleven reservoirs, with a total capacity of about 17,820,000 gallons. The mains will have a length of about 25½ miles; and their diameters will range from 43·3 inches down to 3·9 inches.

Motor-Buses and Public Lamps.—The Works Committee of the Westminster City Council presented a report, at the meeting of the Council last Thursday, to the effect that they had had under consideration accounts for repairs to public lamps damaged by vehicles. They said many of the breakages were caused by motor omnibuses skidding; and it had been held by the High Court that if an omnibus had all the usual and normal improvements, the owners could do no more, and were only liable when they or their servants were guilty of negligence. In eleven out of nineteen cases the owners had offered to pay half the cost, in settlement; and the Town Clerk had accepted the offers. The Committee approved of this action.

Water Supply to London Laundries.—A meeting called by the Launderers' Association, Limited, was held in the Holborn Restaurant last Wednesday evening, for the purpose of discussing clauses affecting the laundry industry contained in the Metropolitan Water Board (Charges, &c.) Bill. Mr. C. Marshall, the President of the Association, occupied the chair. Mr. T. Taylor said that, according to the scale suggested by the Board, the charge would be, according to consumption, from a maximum of 1s. down to 7d. per 1000 gallons, with a compulsory charge for a meter. Compared with returns he had received of present charges, this meant in some cases an increase of 50 per cent., though in other cases there would be a saving. The Board estimated an increased revenue of £43,496 from the new charges for non-domestic purposes; and while there was proposed a reduction for domestic supply of 0·06 per cent., and to public bodies of 12·33 per cent., the average increase for non-domestic supply would be 11·4 per cent. He strongly protested against the way in which the Board were seeking to escape from the obligations imposed on their predecessors. Resolutions were passed authorizing the Council of the Association to co-operate with the representatives of other trades in opposing the Bill when in Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The expression may be somewhat hackneyed, but it is the most accurate description which can be given of the visit of the Western Juniors to the Bonnyside Fire-Brick Works of Messrs. James Dougall and Sons, Limited, this afternoon, that it was most instructive. It being the case that the construction of furnaces and flues is of prime importance in gas-works, and that material must be used which will withstand the high heats employed, a visit to a fire-brick manufactory could not fail to be the means of conveying much information regarding many points upon which there might have been preconceived notions that did not altogether quite conform to reality. The visit disclosed the care with which the clay is prepared, and the ease and simplicity of the appliances by means of which it is made into the desired shapes and sizes; but it also revealed how, though it is easy to mould the clay into almost any peculiar form, there are many risks to be run before some of the special designs of pieces can be satisfactorily fired, and that therein lies the explanation of how the price of specially designed goods is necessarily higher than those of ordinary shape. In the kilns, too, there was a great deal to be learned about the construction of flues, including the arrangements for the admixture of gases, and the direction of the flame so as to produce a uniform heat all over the interior of the oven. There was no stint in the showing of everything about the works which might be of interest to the visitors, even to the process of winning the clay from the huge underground hole designated the pit. It was the desire of the proprietors and of the management that everything should be seen; and this fulness of description led to the proceedings at the end being somewhat hurried, in order that the members of the Association might catch their train for Glasgow. The entertainment of the visitors by the Company, after the works had been inspected, was of the most sumptuous description. The paper by Mr. E. M. Stewart, upon "Fire-Bricks and Retorts" contained quite a mine of information; and the members were not slow to express, both in public and in private, their appreciation of it, and their conviction that it will be of great use to them.

The late Mr. William M'Crae, of Falkirk, was a personal friend of my own, and though his death at the age of 43 leaves a blank which is all the greater in that it has come so soon, it cannot be said that it has come altogether unexpectedly, for his condition of health, and the nature of his trouble, pointed to an early dissolution. It is to be remembered that his brother—the late Mr. John M'Crae, of Dundee—also died of heart disease, and at the early age of 44 years; so that the disease seems to have been of hereditary nature. When Mr. M'Crae presided at the Informal Meeting in Glasgow last April, his Convener was apprehensive of a breakdown in the course of the meeting, and he never left his side—a situation which would not have added to the comfort of those present if it had been known. It was immediately after that meeting that he was obliged to seek repose. He had not been in robust health since; and it is more than probable, from the fact that he resigned his situation a month ago, that he felt his life to be more precarious than it appeared to be to his friends. He had not been without his troubles, both at Dundee and at Falkirk. Indeed, on the day of his death, Mr. A. Wilson, of Glasgow, was in Falkirk inspecting the gas-works; there being, it is reported, some trouble with the foundation of the retort-bench. These worries, no doubt, told upon Mr. M'Crae, and hastened his end. He will be remembered as a gentleman of kindly and cheery disposition; and he has the reputation of having been the most pleasant of men to serve. When the Scottish Junior Gas Association was instituted, he took great interest in it, and was appointed an Honorary Member of both Districts.

The Watching and Lighting Committee of the Glasgow Town Council recommend that, in the event of any owner of a common stair desiring it to be lighted, the net charge be, in the case of incandescent gas, at the rate of 13s. 6d. per light, and in the case of incandescent electric light, at the rate of 15s. 6d. per light; the lamps to be subject to the approval of the Inspector of Lighting. In the Town Council on Thursday, Mr. Barrie asked whether, in view of the fact that the department had agreed to fix up incandescent gas-burners on common stairs, the same opportunity would be given to owners of private streets to fix incandescent burners on street-lamps, and, if so, at what extra cost. Bailie Hunter replied that the proprietor or proprietors of private streets could have incandescent gas-burners fitted in lamps on payment of the following extra charges over the statutory charge of 15s. per annum: Cost of providing burner, 3s.; annual extra charge for gas, 6s. 10d.; annual cost of maintaining mantles, 4d. each; and funnels, 2d. each.

The Gas Committee of the Falkirk Corporation have further reduced to four the short leet of applicants for the post of Gas Engineer and Manager, the gentlemen who have been left in being: Mr. J. M'Leod, of Glasgow; Mr. W. Wilson, of Kirkintilloch; Mr. T. Lighbody, of Renfrew; and Mr. J. Lang, of Fraserburgh. The appointment is to be made next Tuesday.

The Corporation of Wishaw have received an application from a firm of manufacturers for a supply of gas to work a 100 H.P. gas-engine. They have agreed to lay a 6-inch main to the burgh boundary, upon condition that the firm continue the same to their works.

The Town Council of Kirkcaldy had before them at their last meeting the report as to the lighting of the burgh, a summary of which I gave a month ago. The author—the Inspector of Lighting—stated that during the past ten years much had been done to improve the lighting of the burgh, by shortening the distance between the respective lamps, replacing ordinary burners by incandescents, and lighting the tramway route, with the exception of St. Clair Street, by electricity. The incandescent lighting was first installed in 1900, when twelve anti-vibration frames, with "C" burners were fitted into the ordinary lamp globes, and since then the number had been increased yearly, until it had reached a total of 672; and the Town Council have agreed to a gradual displacement of the remaining 352 ordinary burners by incandescents. During the past five years, experiments have been made with various kinds of incandescent burners; and after a sufficient test, the No. 2 Kern, consuming about 2 cubic feet per hour, has been found most economical, and has given the best results. . . . Of the 672 lamps fitted with incandescent burners, 338 consume 3 cubic feet of gas per hour; 144 consume 2½ cubic feet; and 190 consume 2 cubic feet. There are 1024 gas-lamps and 104 electric arc lamps. The cost for the year ending May 15, 1906, was: For gas, £1604; and for electricity, £1248. The cost per mile was: For gas, £56; and for electricity, £277. Appended was a report by Mr. H. O'Connor, F.R.S.E., of Edinburgh,

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 268.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	20⅜—21½	..	4 17 8
245,112	10	,,	7½	Do. 7 p.c.	14—15	..	5 0 0
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- mouth Gas and Water { 10 p.c. / B 7 p.c. / Pref. 6 p.c.	28—29	..	4 16 7
51,810	10	,,	7		17—17½	..	4 0 0
53,200	10	,,	6		15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262—267	..	4 13 8
300,000	,,	,,	9½	Do. New	203—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	232—237	..	4 14 11
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	+½	4 13 0
104,600	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11⅜—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	9—9½	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5 5/16	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	107—110	..	4 10 11
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
700,000	Stk.	,,	6½	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
485,090	10	July 27	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4 1/16	Gas- light and Coke { 4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb.	100—102	..	4 6 3
2,600,000	,,	,,	3½		90—92	+1	3 16 1
3,799,735	,,	,,	4		107—110	..	3 12 9
4,193,975	,,	Dec. 13	3		84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	181—184	+5½	4 7 0
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	−1	4 7 9
718,100	,,	,,	7	Do. B	167½—163½	..	4 3 1
144,140	Stk.	Sept. 13	7⅝	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of Melbourne { 5 p.c. Deb. / 4½ p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½		101—103	..	4 7 5
541,920	20	Nov. 14	3⅝	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110—111	..	4 3 4
406,625	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6⅛	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅜—8¼	..	4 6 2
796,980	5	July 27	5	Do. 5 p.c. Pref.	5¼—5⅝	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13¼—13¾	..	5 16 5
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—85*	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	+2	5 0 0
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130*	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	+2	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham and Edmonton { A 5 p.c. / B 3½ p.c. / 4 p.c. Deb.	127—130	..	5 0 0
388,020	,,	,,	5		104—106	..	4 14 4
137,500	,,	Dec. 28	4		101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10⅛—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- worth and Putney { A 5 p.c. / B 3½ p.c. / C 3½ p.c. / 3 p.c. Deb. Stk.	—	..	—
255,636	,,	,,	6½		140—145	..	4 9 8
75,000	,,	,,	5⅝		113—115	..	4 17 6
79,416	,,	Dec. 28	3		79—82	..	3 13 2
779,875	,,	Aug. 15	5⅝	West Ham 5 p.c. Ord.	104—107	+1½	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

in which he stated that, by request of the Inspector, he had attended at Kirkcaldy on the 26th of September, and on the 3rd and 16th of October, and tested sundry electric lights and incandescent and flat-flame gas-lights, as used throughout the town. . . . He found that the electric lights gave an average light of 670·9 candles. The electric incandescent burners gave a light of 12·3 candles. The gas-lamps he tested in various parts of the town, and found that the best results were obtained from the 2-feet Kern burner used in the new pattern lantern, which gave an average of 40·5-candle power, or 20·25 candles per foot of gas consumed. The 2½ cubic feet "C" burner varied considerably, according to the lantern used; the average being 32-candle power, or 12·8 candles per cubic foot of gas consumed—the difference of a good lantern influencing the light some 30 per cent. The 3 feet "C" burner gave an average light of 37·9-candle power, or 12·63 candles per cubic foot of gas consumed. These results pointed to the advantage of using a good lantern, with reflectors at correct angles, with the best type of burner. The flat-flame burners tested gave a light of 9·44-candle power, or 4·72 candles per cubic foot of gas consumed. He also tested a Lucas lamp outside the Gas Company's office, which he understood consumed 24 cubic feet of gas per hour. The lamp gave a light of 780-candle power, or 32·5 candles per cubic foot of gas consumed. As a comparison of the cost of the electric arc lights and the high-power Lucas gas-lamps, it might be mentioned that the former cost £12 per annum for (say) 1277 hours of burning of one arc lamp till 11 p.m., and two incandescent electric lamps for the rest of the time. For a Lucas lamp lighted until 11 p.m., and two 2-feet Kern burners the rest of the night, the cost would be £4 16s. 8d. with gas at 2s. 5d. per 1000 cubic feet. This price was for a practically equal light to 11 p.m., and for six or seven times the light for the rest of the night. The electric arc lamps showed an average cost per candle power per annum of 4·25d. The aim of street lighting should be as near an approach to sunlight as possible—an even illumination all over the roadway—and not to have brilliantly lighted spaces alternating with dark ones. With the electric lights giving a high candle power near the lanterns, the intervening spaces were comparatively dark; while with the smaller gas-lamps, put at much closer distances, the light was more general and better diffused. As regarded the light derived from the incandescent electric lights, little need be said, as they only gave a small amount of light, and that at such a distance apart that no even illumination of the streets need be looked for. Mr. Allison, in moving that the reports should be remitted to a Special Committee for investigation, said that the 29 miles of streets which were lighted by gas cost, with all oncosts, £3228; while the 4½ miles which were lighted by electricity cost £1248. If the whole of the streets in the burgh were lighted by gas, the cost would be £3741, or £501 for the 4½ miles at present lighted by electricity. This made a waste of £746 on the 4½ miles. Mr. Gourlay considered the report a very startling one, and he thought they would be scarcely justified in continuing the electric light, if it were to cost so much more than gas and not light the streets so well. After discussion, it was agreed to remit the reports to the Lighting and Electric Lighting Committees, the understanding being that the Electrical Engineer might have some reply to make to them.

Some time ago the gas-works in Ecclefechan—a village of about 800 inhabitants—were closed, and since then there has been no public illuminant in the place, to the inconvenience of the community. This state of matters is in course of being remedied. Mr. E. J. Brook, of Hoddom, has purchased the gas-works, and has given an order to Messrs. Spencer and Co., of Stratford-on-Avon, to fit up a De Laitte petrol gas plant in duplicate, of sufficient power to light every building, public and private, in the village. Mr. Brook does not seek to make profit out of the undertaking, and has announced that he will sell gas for all purposes at 2s. 6d. per 1000 cubic feet, with meter-rents, the minimum of which is to be 2s. 6d. a year. The new lighting scheme is being largely supported, many applications for connections having been already received.

The Douglas Gas Lighting Company have presented to the Upper Ward District Committee of the Lanark County Council an account for £28, in respect of damage caused to gas-pipes by the use of the road-roller. The Council have resolved to deny liability; but they have instructed their Surveyor that, in future, when rolling Douglas streets, he is to refrain from working where danger of breaking water or other pipes might be anticipated.

Proposed New Gasholder for Shoeburyness.

The Shoeburyness Urban District Council having applied to the Local Government Board for sanction to borrow £1700 for a new gasholder, Major J. Stewart attended to hold a local inquiry. The Clerk (Mr. F. Gregson) said the holder had become absolutely necessary in consequence of the increase in the consumption of gas; and the Council had previously accepted the tender of Messrs. S. Cutler and Sons at £1434 for a holder of 60,000 cubic feet capacity. The Council themselves were to lay the foundations, the cost of which was estimated at £100. In addition, the expenses of the loan were put down at £20, and contingencies (10 per cent.) at £146, making £1700. He asked that the repayment of the money might be spread over 30 years, or as long a period as possible. The Inspector said he saw by the plans that they had only one small holder; and if anything went wrong, they would be in considerable trouble. The figures he had before him showed that between 1897 to 1900, the consumption of gas nearly trebled. In 1897, the quantity was 1,300,000 cubic feet; in 1898, 1,800,000 feet; in 1899, 2,700,000 feet; and in 1901, 3,100,000 feet. Mr. Gregson said he should think that this quantity had doubled by now; but he could not say for certain off-hand. Subsequently, Messrs. Cutler were communicated with; but they stated that, as prices had gone up since the tender was sent in, they would have to increase the amount. Thereupon the Council, on the motion of Mr. Neil (who pointed out that as the winter was now nearly over, the erection of the holder could be deferred), it was agreed that the question should stand over for two months. The Council thanked Messrs. Cutler for their trouble.

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CURRENT SALES OF GAS PRODUCTS.

Week ending Jan. 26.

The London market for tar products is still in an improving condition. With regard to pitch, stocks are at the present time abnormally low, in consequence of heavy shipments; while 1s. 6d. to 2s. per ton more than the late low prices has recently been paid. London makers are very full with orders for some time to come. There is more inquiry for 60's crude carbolic acid; and 1s. 9d. net is asked for a limited quantity. Benzol 90 per cent. is firm at 1s. to 1s. 0½d. net. It is reported that a large business has been done in ordinary London creosote oil at 2½d. net in bulk at makers' works. Sulphate of ammonia is also in an improving position; the closing price being £12 5s. on Beckton terms for February delivery.

LIVERPOOL, *Jan.* 26.

Sulphate of Ammonia.

The week opened with good demand, available parcels being readily picked up at hardening prices. Later, however, buyers were less keen; and the market closes quietly at £11 15s. per ton f.o.b. Hull, and at £11 18s. 9d. per ton f.o.b. Liverpool. At Leith, the market has been somewhat irregular; and the closing quotations are £12 to £12 2s. 6d. per ton f.o.b. There has been some buying for February delivery at a premium of about 2s. 6d. per ton on spot prices. For March-April delivery there have been sellers at £12 7s. 6d. per ton, but no business thereat has transpired; and Leith, April-September delivery, has been quoted £12 5s. per ton without finding buyers.

Nitrate of Soda.

This article has been firmer in the forward position, and the spot market has been steady at 11s. 3d. per cwt. for 95 per cent., and at 11s. 9d. for refined quality.

LONDON, *Jan.* 26.

Tar Products.

There has been rather more business doing during the past week, and markets have remained generally firm. Pitch is quiet but steady. There are indications that the bottom has been reached for the present, and probably it would no longer be possible to buy at 24s. on the East Coast, though a small quantity might be secured at 24s. 6d. On the other hand, some of the best makers report having been offered 25s. for delivery to June. In Liverpool and Manchester, there does not seem to be very much business doing—makers not seeing their way to accept the values offered by dealers. There is a certain amount of buying going on in South Wales; but consumers in this district do not appear to be at all anxious, and are evidently fairly well covered. On the Continent, they only seem willing to consider business for next season; and for this delivery, they will only entertain offers at to-day's prices. Creosote is very firm, with the exception of prompt London oil, of which there is still some quantity to be placed; but for forward, London manufacturers are very firm indeed, and do not appear at all anxious for business. In the North and Midlands, manufacturers are very well sold, and unable to consider business for February-June to any extent; while for the last six months of the year they refuse to quote. Solvent naphtha was decidedly easier early in the week, and business was done upon the east coast at 1s. 1d. to the end of June. It is now, however, rather firmer, and sales are reported at 1s. 1½d. and 1s. 2d. over the same period. Benzol, 90 per cent., is quiet. Some small quantity could no doubt be obtained for prompt delivery at 1s.; but for forward, makers do not care to quote. In the North, business is reported to have been done at a little over 10d. per gallon at makers' works. Benzol, 50-90 per cent., is steady; but there does not appear to be much anxiety to do business. Sellers refuse to quote prices, and will only consider offers made to them. Carbolic acid is quiet. Some of the English consumers report having covered their present requirements to June, and are now only open to consider low offers. Continental consumers refuse to pay more than 1s. 8½d. on the east coast, and state that they are getting supplies at this figure. In crystals, there is no alteration, and business continues to be done at market prices. Toluol is steady, and fairly well sold. Not many parcels are offering, but those that are command good figures. Sales of tar continue to be reported at very low figures, both for prompt delivery and upon contract.

The average values during the week were: Tar, 13s. to 17s. Pitch, London, 24s. 9d. to 25s.; east coast, 24s. 6d. to 25s.; west coast, 23s. 6d. to 24s. 6d. Benzol, 90 per cent., 11d. to 11¾d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2⅛d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £5 to £9; salts, 34s. to 37s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market for this article has been steady during the past week, and prices have certainly improved somewhat. There is no alteration in the quotations of the principal London Gas Companies; but the very wide margin which existed previously between them and other London makers no longer exists, though second-hand parcels are reported to have been sold in London for immediate delivery at low figures. In Hull, fine makes have been sold at £12. The same figure has been paid for February-March, and makers prefer now to await the course of events before selling any further quantity. In Liverpool, business is reported to have been done at £12; while even higher figures have been offered for forward delivery without success. In Leith, dealers have offered £12. These prices, however, makers have refused to consider; they being well sold, and not at all anxious for any further business this side of March.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

As was pointed out last week, there is every probability of still higher prices being charged for coal and cannel for gas manufacture, as well as for engine fuel and coal for domestic purposes. The sudden descent of a frosty temperature has given an impetus to sales in most directions; and more coal is wanted for shipping. Meetings have been held in the North, in Yorkshire, and in London to consider the advisability of making advances; and in some districts, the price of all grades of manufacturing and engine fuel and slack has been raised 1s. per ton. In Lancashire, no decided united action has yet been taken; but it is not unlikely that a meeting of coalowners may be held to-day in Manchester, to consider what steps, if any, shall be taken. In the meantime, last week's quotations may be relied upon to hold good to the end of the present month. Yesterday, the price of coke for household consumption was raised from 5s. 10d. to 7s. 6d. per ton. In another fortnight, the price will be again increased.

Northern Coal Trade.

There is continued activity in the coal trade of the North-east; and the tendency in prices has been towards further advances, so that the quotations are higher than for some time. In the steam coal trade, there is a demand that is unusually full for this season of the year. For best Northumbrian steam coals 13s. 6d. and up to 14s. per ton f.o.b. are the quotations. Second-class steams are 12s. 6d. to 13s. per ton, and steam smalls are steady at from 7s. 6d. to 8s. 6d. The collieries are now working regularly, and the normal output seems to be well taken up. In the gas coal trade, there is less pressure in the demand. It is, however, full, and there is still some scarcity of best Durham gas coals. Deliveries are heavy on the long contracts, and prices are very well sustained for all qualities. Quotations are from about 11s. to 12s. 6d. per ton f.o.b., according to quality, &c., and up to 13s. is quoted in cases where collieries have a large part of their output well sold forward. There is nothing new as to contracts this week; but a large Swedish one must be soon in the market. Coke is very firm; and gas coke shows little change—the current price for good gas coke varying from about 13s. to 13s. 9d. per ton f.o.b.

Scotch Coal Trade.

Trade has been strong during the week. Ell is in great demand for shipment, and very scarce for prompt delivery. Splint is firm. A large volume of business is being done. The prices quoted are: Ell 11s. 3d. to 12s. 6d. per ton f.o.b. Glasgow, splint 12s. to 12s. 6d., and steam 10s. 6d. to 10s. 9d. The shipments for the week amounted to 254,888 tons—an increase of 74,027 tons upon the preceding week, and of 28,475 tons upon the same week of last year. For the year to date, the total shipments have amounted to 524,076 tons—a decrease of 6825 tons upon the corresponding period.

The Price of Gas Coal.

Writing on the subject of the price of gas coal, the "Iron and Steel Trades Journal" says that an important step is being taken by the owners of gas-coal pits in the Midlands, working in combination, to considerably raise the market price of gas fuel. The object is to secure a share of the revenue now finding its way into the pockets of the gas shareholders; the colliery owners having for some time "looked with an envious eye" on a proportion of this profit. It is hoped that fully 2s. 6d. per ton advance will be secured when the contracts for 1907-8 delivery come to be made; and it is stated that members of the proposed Association of colliery owners shall not go on supplying works over contract quantities except at an advance of 1s. per ton up to June next. Some fear is expressed, however, that the non-adherence of one or two large firms famous for underselling may stand in the way of a satisfactory agreement. The first move in the direction of an Association has been forced on the colliery owners by the miners' leaders, who have plainly intimated to owners that, unless the price of gas coal was considerably advanced—that is, to rates which would bring up the average selling price to a figure which would show in their favour, in case they wished at any time to apply for an advance in wages—they would bring the men out on the question.

Price of Gas in New York.—We learn from "Progressive Age" that the Appellate Division has affirmed a decision of the Supreme Court of New York, refusing to grant to Mr. Dinkelspiel, a consumer of the Consolidated Gas Company, a *mandamus* directing the Company to supply him with gas at 80 c. per 1000 cubic feet. Justice Bischoff based his refusal on the ground that there was an issue of fact raised between the parties concerning the production cost of gas, and that where such an issue is raised a *mandamus* will not be granted on mere affidavits, but only where necessary after a trial. A large number of similar applications were dependent on this case, and the action of the Appellate Division in affirming the decision is considered a victory by Counsel for the Company.

New Joint-Stock Companies.—The Tenterden Gas Company, Limited, has been registered with a capital of £2400, in £10 shares, for the supply of gas in Tenterden. The Company was originally constituted by Deed of Settlement dated Aug. 31, 1838; and the undertaking has been governed by this and various supplementary deeds. The Waste Heat and Gas Electrical Generating Stations, Limited, has been registered with a capital of £100,000, in £1 shares, to generate, store, transmit, purchase, supply, and distribute electrical and other energy for motive power, light, heat, or other purposes, and to utilize and deal in the waste products of, and gases and waste heat from, any works, coke-ovens, furnaces, or factories, &c. The Ramie Wool and Flock Mills Company, Limited, has been registered with a capital of £64,000, in £1 shares, to acquire the Unsted Mills, Shalford, Surrey, and a secret process relating to the treatment of ramie, &c., and also to adopt an agreement with Mr. L. H. Raw.

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(View annexed.)

Proposed Duplication of the Plymouth Water-Main.

At their meeting last week, the Water Committee of the Plymouth Corporation had under consideration a proposal to duplicate the main-pipe through which the town is supplied with water. About fifteen years ago, a pipe was laid as a substitute for the open leat by means of which the town had been supplied up to that time. The water flows from the storage reservoir at Burrator, on Dartmoor, to Roborough, about six miles from the town, where there is a service reservoir. From this point onward, the main is drawn upon for supplies *en route*, and complaint has been made that at Crown Hill, three miles from Plymouth, where there are large military barracks, the pressure is inadequate. This circumstance, coupled with the fact that owing to the increase of population the demand is continually growing, led the Committee to the conclusion that a second main is desirable. It was therefore decided to include in the estimates of capital expenditure for next year a sum of £15,500 for this purpose. As an alternative to the scheme, it was suggested that a small pipe should be laid from Roborough to Crown Hill, so as to give the latter place a constant supply. The Committee, however, came to the conclusion that a second main of large dimensions is desirable, in order to safeguard Plymouth against the discontinuance of the supply through any accident to the existing main. Some years ago £14,500 was borrowed for the purpose; but the money has not been utilized for the water-works, though the undertaking has been charged with the interest and sinking fund upon it. If the Corporation approve of the proposal to proceed with the scheme now, the remainder of the money required will be borrowed.

Water-Works Transfer at Skelmersdale.

A meeting of the property-owners and ratepayers of Skelmersdale, convened by the Urban District Council, was held at the Town Hall on Monday last week, to consider the terms of an agreement, dated Aug. 21, 1906, whereby the Council had undertaken to transfer their water-works in the township of Lathom to the Southport, Birkdale, and West Lancashire Water Board. The Chairman of the Council (Mr. John Pearce), who presided, explained that the Council were not selling the mains in Skelmersdale, but the works and mains outside and up to the boundary of the township. During the last seven or eight years, the constantly decreasing supply of water at the Scarth Hill well had been a source of anxiety to the Council. Not only so, but the water area had been encroached upon considerably by the sinking of other wells in the neighbourhood. The climax had come when the Water Board sought to promote a Bill which provided for the sinking of a well in Bickerstaffe, at a distance not greater than two miles from the Council's well at Scarth Hill. The Council then proceeded to safeguard this well, and obtained a protective clause, which had cost £538. With a district of which the assessable and rateable value was constantly decreasing, and with a rate of 3s. 6d. in the pound, they thought that, instead of expending upwards of £1000 in making alterations to the well, and another £600 in opposing the Bill, it would be wise to enter into negotiations for the sale of their water undertaking at Scarth Hill. But they had assured the safety of the Skelmersdale water supply. By a clause in the Bill, Skelmersdale was to be provided with water in perpetuity. It would have the first claim upon the water from the Scarth Hill well, and their supply would be safeguarded to the extent of 75 million gallons, whereas the consumption in the highest year had never exceeded 45 millions. The Council had agreed to accept £22,500 for their water undertaking. By this transaction, they hoped to be able to reduce the rates by 11d. in the pound. A resolution approving of the transfer was carried unanimously.

The Debt of London.

The Statistical Officer of the London County Council (Mr. E. J. Harper) has prepared a return, under the direction of the Finance Committee, relating to the debt of the various London Local Authorities—showing for each Metropolitan Borough and Poor Law Union the debt outstanding on March 31, 1906, and the annual charge on the rates in 1905-6 in respect of such debt, together with an analysis of the total debt of London according to the nature of the services for which loans have been raised. The return shows that the total net debt of London on March 31, 1906, secured upon the rates was £105,602,301, of which £50,902,464, or 48 per cent., was in respect of water supply, tramways, workmen's dwellings, electric lighting, and certain other revenue-producing services, the debt charges in respect of which are for the most part met out of the receipts from such services. The total charge in 1905-6 for interest and repayment in respect of the total net debt amounted to £5,637,502, of which £3,883,446 was met out of the rates, and the balance of £1,754,056, or 31·3 per cent., out of the receipts from revenue-producing services. The total net debt, excluding London's proportion (£38,575,517) of the debt (£47,393,371) of the Metropolitan Water Board, increased during the year 1905-6 by £1,238,763, or 1·9 per cent., as compared with an increase of £4,521,691, or 7·4 per cent., the previous year. This increase is the smallest for eight years; the average annual increase since 1896-7 being £3,372,000. It is, moreover, entirely due to the increase of debt upon revenue-producing services; the debt in respect of other services showing a net decrease of £240,000. The responsibility for the increase of the net debt is divided as follows: London County Council (including education), £613,933; Metropolitan Borough Councils, £851,818; other bodies (decrease), £226,988. The increase in London's proportion of the debt of the Metropolitan Water Board, excluded from the above figures, was £1,098,995, representing an increase of 2·93 per cent. The percentage of the total net debt to rateable value increased in the year from 254·37 to 256·80. The total charge on the rates increased by £1038, or 0·03 per cent., compared with an increase of £240,022, or 6·6 per cent., the previous year. The equivalent average rate in the pound has decreased from 1s. 10·90d. to 1s. 10·59d.—*i.e.*, by 0·31d. in the pound.

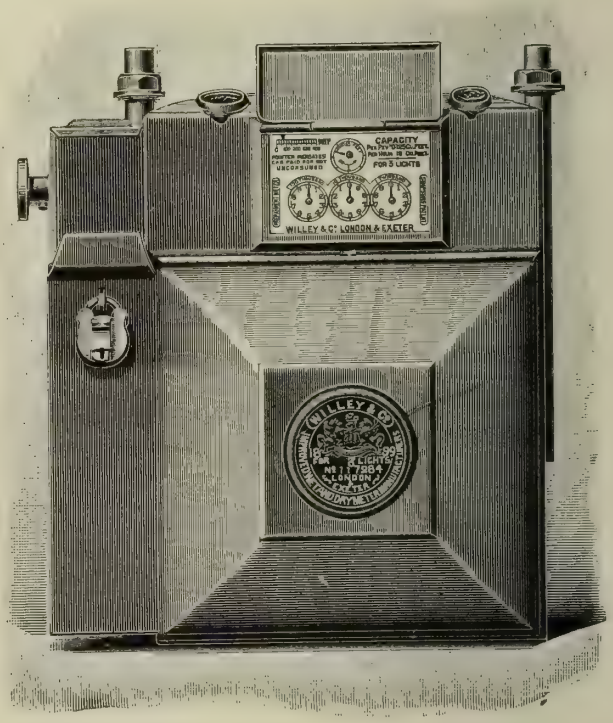
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The Jamaica Earthquake.—Recent advices from Kingston are to the effect that the gas-works have been practically annihilated by the recent earthquake; and it is feared that illumination by gas will be impossible for the next six months. Water, however, is plentiful; and people are returning to the few habitable houses.

The Explosion at the Dublin Gas-Works.—A second death has unhappily occurred as the result of the explosion which took place at the gas-works in Great Brunswick Street, Dublin, on the 10th inst. Michael M'Donagh, whose condition was all along regarded as very serious, died at the City of Dublin Hospital last Sunday week.

Colne Valley Water Bill.—It is stated that the Hendon Rural District Council have decided to oppose the Bill which the Colne Valley Water Company are promoting to give them power to increase their capital. Besides this body, other local authorities will also oppose the Bill, as now that the Company have reached their maximum dividend, it is thought the ratepayers should enjoy the benefit of a lower water-rate—which they fear is not likely to be the case if the Company are allowed to extend their capital and incur fresh liabilities.

Totnes Water Supply.—A scheme for increasing the water supply was approved by the Totnes Town Council last Tuesday. Under the agreement, the Corporation are to have the right of taking a supply of water from Follaton to supplement the existing supply. It was stated that the undertaking is in a very flourishing condition. Last year the profit was £200; and it might have been more, had it been possible to give a supply to certain consumers. The cost of the new supply is estimated at from £130 to £150 a year; but it is thought that the additional revenue will cover this.

Coventry Water Scheme.—An interesting point has now arisen in connection with the arrangement that the Coventry Corporation have entered into with Birmingham for the supply of water from the latter's Shustoke reservoir. The suggestion is being put forward that the villages between Birmingham and Coventry through which the pipe is to be laid should be allowed to take a supply. Coventry will, of course, oppose this idea; but Birmingham may be open to make some arrangement. It is stated that the Warwickshire County Council have expressed the opinion that the villages in question should be enabled to take a supply; but nothing has yet been settled.

Devonport Water Company.—The last stage in the history of the Devonport Water Company was reached on Thursday, when a meeting of the stockholders was held to adopt the final account of the Liquidators, who are the Directors of the Company. Mr. Foster J. Bone, the Secretary, presented the accounts, which were adopted. A resolution was passed authorizing Mr. Samuel Wood, the Accountant who settled the scheme for the distribution of the purchase-money and assets, to determine how the balance in the hands of the Liquidators shall be allotted among the stockholders and the Directors and officers. Mr. Bone was instructed to send to Mr. Wood a list of the Directors and officers, with particulars of their service, &c.

Lectures on Gas-Meters in Belfast.—Mr. C. P. Knight (representative in Ireland of Messrs. Parkinson and W. & B. Cowan, Limited) recently delivered two most successful lectures, on gas-meters, to the students of the "Gas Distribution" class at the Municipal Technical Institute, Belfast. The lecturer illustrated his remarks by exhibiting, upon each occasion, beautiful working models of various meters; also an interesting selection of optical lantern slides. The valuable instruction and practical demonstrations were highly appreciated by those present. In response to urgent requests, Mr. Knight has consented to lecture on gas-meters before a larger audience on the 28th prox., under the auspices of the Belfast Gas Department Technical Guild.

Paris Water Supply.—It is not a little curious that while the Municipal Council of Paris are occupied with the question of the gas supply of the city, that of the supply of water should also be before them. Though the city own the whole of the water-works, they are actually operated by a concessionary Company, who are now applying for a renewal of their concession for 25 years. The Prefect of the Seine, who has reported upon the subject, advises that the application should be granted, as he considers it would cost the Municipality about £20,000 a year more to carry on the work themselves than to have it performed by the Company. The gross receipts of £880,000 a year are earned at an estimated cost of £44,800 a year, whereas, according to the Prefect, it would cost the municipal authorities not less than £64,000 per annum to arrange for the distribution themselves.

Gas Suffocation Case in London.—Last Wednesday, an inquest was held at the Marylebone Coroner's Court on the body of Miss Howard, an actress, who was on Monday morning found dead in her New Cavendish Street flat. The evidence showed that she was suffocated by gas which was escaping from a stove. A servant in the deceased's employ said she found on examination that the screw-tap had not been properly screwed up. The tap was very loose; and it was possible that, in attempting to screw it up, one might not do so properly. A year ago she found her mistress in an insensible condition; and on that occasion the gas-stove, which had been turned on, had not been lighted. It was, however, stated by a friend who was with Miss Howard the evening before her death that she was then in high spirits; and the Jury returned a verdict of "Death by misadventure."

Penrith Water Scheme.—The ratepayers of Penrith, in public meeting, have almost unanimously approved of the proposal of the Urban District Council to spend about £48,000 on a water scheme, to bring a supply from Hayeswater Tarn, on the hills between High Street and Grey Cragg. The principal objections raised were that the figures placed before the ratepayers now and in connection with a former gravitation scheme displayed serious discrepancies. This the Clerk denied; asserting that the changed conditions alone accounted for the differences. It was also stated that the draft agreement with the Earl of Lonsdale's Trustees provided for an inclusive payment for all rights and works, as well as the taking of 750,000 gallons a day—as much as a 9-inch main would carry. The water question has been under discussion for nearly seventeen years; and it is stated that no previous scheme has had the least chance of securing unanimity.

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ACTUAL FACTS

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Owing, it is supposed, to the severe weather, the lighting of Lausanne failed last Thursday, and the town was left in darkness.

The tender of Messrs. Thomas Cash, Son, and Co., of Birmingham, has been accepted for the supply to the Nottingham Corporation Gas Department of 15,000 tons of cannel over the current year.

Messrs. John Wright and Co. send a list of some fifteen important places in and around Glasgow where their gas-heated steam radiators have recently been installed, and which they say is "but about a quarter of the full list."

The left bank of the Seine was put in darkness for three hours last Tuesday by an accident at the electric light works, and the business at the Senate, Courts of Justice, and Prefecture of Police had to be carried on by the aid of lamps and candles.

Messrs. Joseph Taylor and Co. have received from the Bodmin Gas Consumers' Company, Limited, and the Carlow Gas Company orders for their best makes of solid-plate lead saturators, in both cases guaranteed for a period of six years against all leakages; also further orders from Messrs. William Butler and Co., Limited, of Bristol, comprising lead pipes and bends for their Gloucester works, in connection with the waste gases and ammonia, and also for a sulphate drainer.

An application has been made to the Local Government Board by the Cowes Urban District Council to borrow £970 for works connected with a new main, with a view to improving the supply of water to the highest levels of the town—making it continuous instead of intermittent. The arguments at the public inquiry before Lieut.-Col. H. E. Smith were chiefly against the expense for so comparatively small a district; while as to the alleged continuous supply, doubts were thrown upon this idea—the town having previously heard of schemes of this character which had never been carried through.

In the last number of the "JOURNAL," reference was made to a lecture on "Coal and its Bye-Products," recently delivered at the Stockton Literary and Scientific Institute by Mr. Dunn, the Assistant-Manager of the gas-works. It was one of several which he has been giving in the town, and we learn that the audiences have always been large. A gratifying feature about the lectures is that the proceeds of practically all of them are devoted to the Stockton Hospital Extension Fund.

At the annual tea and concert of the Scarborough gas workers, Mr. A. Allan, the Manager, who presided, pointed out that distress in the town was very acute; and he suggested that those present—whose work was constant—should contribute to the unemployed fund. Speaking of the gas industry, Mr. Allan remarked that he was glad Scarborough was sharing in the general progress. Their increase during the past year had been a very good one; and the fact that an increase took place in the summer months indicated that the season had been successful, for the consumption of gas might be taken as a good pulse.

In the course of a paper, entitled "Gas Superior to Electricity for Lighting Purposes," read before the Newcastle Y.M.C.A. Chamber of Commerce, Mr. E. A. Robson said that gas gave an increased candle power as compared with electricity, which reduced the price to the extent of as ten to one. It also gave a more diffusive light, making it less harmful to the eyes. Gas was more adaptable for general outdoor and indoor illumination; and better ventilation was secured, because the heat which was generated caused a motion of the air, which reduced the risk of infection in crowded rooms. There was much less risk of fire, because gas required a naked light before it would burn, whereas with electricity various circumstances might lead to a conflagration. There was, further, a greater reliability of supply with gas, because there was no risk of stoppages due to a breakdown at the works.

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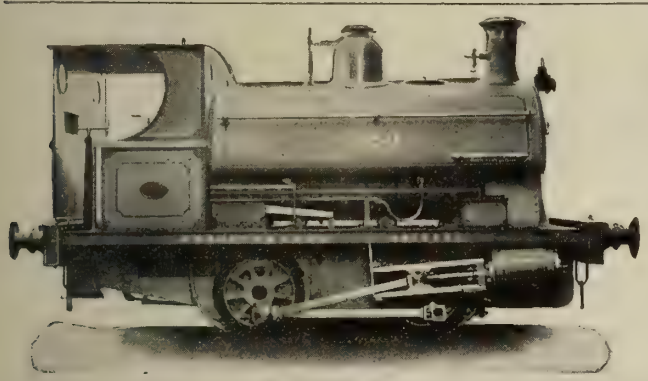
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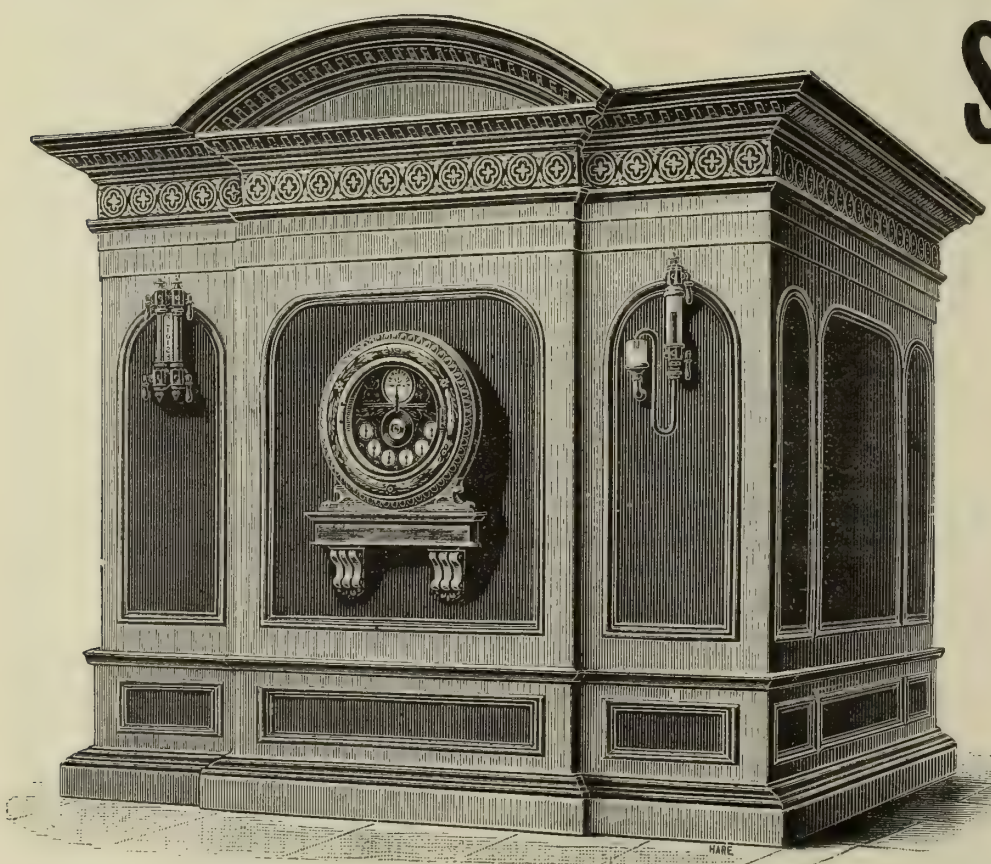
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VOL. XCVII., No. 2282.——TUESDAY, FEBRUARY 5, 1907.

EDITORIAL NOTES—GAS, &c.

Meeting of the Gaslight and Coke Company.

BREVITY and serenity were characteristics of the meeting of the Gaslight and Coke Company on Friday; and therein is the best evidence the Governor (Mr. Corbet Woodall) and his fellow-Directors could have of the thorough agreement of the proprietors with the lines of policy that have been adopted, and of their satisfaction with the results so far accrued. The policy that underlies action is a constructive one, involving the past, present, and future. There has been a great deal to undo and alter; and much to remove that was debilitating in the organization. The effect is found in the present, and the influence will be felt still more in the future. True, in one quarter of the immediate future, there is gloom. The several credits derived from the improved working and administration will have set against them a greater cost for raw material—a matter to which the Governor specially directed notice in the course of his address. The improvement in working, however, that has resulted from latter-day policy has put the Company in a stronger—a much stronger—position to face the stress of the current and threatened coal market conditions than they would have been in had things been (as they have been) otherwise. The position of the coal market is dealt with in another article; and it will be there seen with satisfaction that, while the Company dare not, in view of higher coal prices, contemplate at the present a reduction in the price of gas, still the Board have resolved that nothing short of absolute necessity will induce them to raise it.

The Governor's speech was explanatory of the many main points of the report and accounts upon which we commented last week; and, so far as they are concerned, there is really very little upon which to further remark. The proprietors had brought before them very forcibly the vast change that has come over the gas industry in its capital outlay, by the ever-widening bifurcation of internal and external capital needs. Of a capital expenditure of but a few hundreds short of £70,000, only a sum of a little over £4000 was spent otherwise than on meters, stoves, and distribution plant. This is a remarkable testimony to the unabated vitality of the prepayment meter system, the business from which, if not so profitable as some other branches in which the consumption per service is greater, has a wonderful effect in broadening the base of the gas industry. The importance of an extensive base requires no emphasizing in the pages of a paper dealing so largely with engineering topics. In connection with the fitting up of consumers' houses under the prepayment system, it was explained by the Governor how part of the increased expense under repair, maintenance, and renewals in the distribution department had been due to the final extinguishing of the suspense account to which it has been the custom to charge a proportion of the cost of pipes and fittings placed in consumers' houses. The relief thus obtained will enable the Company to follow in future the sound financial practice of charging depreciation in due proportion against each particular class of apparatus. It was an obligation upon the Directors that they should complete the rearrangement of the accounts in this single respect by the end of 1906. At the same time it is a proper step; for there is no part of a gas undertaking's effects that require such generous treatment in the matter of depreciation as the appliances that are to a large extent removed from direct supervision, and placed under the charge of more or less intelligent and careful consumers.

A matter that was hailed by the proprietors with intense satisfaction was the considerable continued advance of improvement in the carbonizing returns. The great saving in coal, coke, oil, and spirit, and other manufacturing expenses (upon which observation was made in dealing with the accounts last week), with at the same time an increased output of upwards of 116 million cubic feet of gas, is a matter of considerable significance. There has been a great overhauling of the carbonizing plant in recent times. Guided by technical counsel, uneconomical plant has been abandoned, reconstruction work has been going forward, and improved appliances have been adopted; and the Board have found that the money so spent yields a rich harvest. This work of renewing, in improved form, much of the most important of the functional parts of the works is not yet finished, and is going to be further pursued. But it is not from works alone that such a tangible accretion of profit has been derived. There has been a great reorganization in the details of working; and, may we not add, individual responsibility, under the changed *régime*, has been given greater and fairer play. The present success, though the weight of old clogs is still felt and must long be felt, is the refutation of past policy. The success is not (as has already been shown by us) alone represented, as an electrical contemporary seems to imagine is the case, in the 1·1 per cent. increase in consumption in the past half year. In regard to this increase, however, the half year embraced an exceptionally hot, bright, and long period of summer weather; and it was only towards the end that consumption promoting conditions prevailed. Nevertheless, the 1·1 per cent. is the equivalent in the case of this Company in the half year of a volume of gas measuring more than 116 million cubic feet. When this is considered, it is somewhat foolish to sneer at the inclusion of even the odd ·1. As to future business, everything is being done that is possible in ensuring good relations between the consumers and the Company. Great activity prevails in the department specially organized and officered for this work. The men receive technical instruction, lectures and demonstrations for consumers are frequent, and the Company's lady demonstrator and her assistants, in addition to paying visits to consumers' houses, find themselves in frequent request for advice.

There was one other point in the meeting; and that had reference to the amount of unaccounted-for gas. It was raised by a proprietor, whose engineering knowledge enabled him to fix upon a source of not inconsiderable responsibility. The Company's unaccounted-for gas is a shade only in excess of the average of the London Companies, and lower than in the majority of other undertakings. But, notwithstanding, there is no Gas Company whose distribution system is more exposed to disturbance than this one, on account of the great amount of subterranean work that has been, and is, proceeding in London. Tubes, trams, sewerage, and electricity and telephone works all contribute to the loosening and falling away of the soil below and at the sides of the pipes. The evidence given by Mr. G. F. L. Foulger before the Royal Commission on Motor Cars (reported in the "JOURNAL" for Aug. 21 last, p. 529) attaches interest and due importance to the point. That the unaccounted-for gas is not more than it is, attests the watchful supervision exercised in protecting both the public and the Company, under a condition of things that was not contemplated when the major part of the present gas canalization of London was constructed.

South Metropolitan Report and Accounts.

As usual, the report of the Directors of the South Metropolitan Company is no formal, prosaic document. It arrests attention. In its opening paragraph, it reminds us that the times have changed; and with the times the work of gas supply and the anxieties of gas administrators. Compared with some few years ago, the markets in which raw materials are bought and secondary products sold now vibrate more readily with external influences; and they require Directors to be ever on the alert. Municipal trading had not a few years ago attained the proportions of the present; and rates

were then moderate, and fairly uniform. Competition, too, was not so rife as it is to-day, and competition moreover that is largely carried on by the aid of the increased rates. The heavier demand for rates is bad enough for industry of any kind to bear; but for a gas company to have to shoulder the heavier rates, and to encounter competition supported by them, is putting a great strain upon human endurance. Combined with these disturbances to the gas business pursuing an even tenor, the industry has not yet emerged completely from the long period of transition through which it has been passing. The character of the business has been undergoing a vast change. More capital is now required outside the works for the business done; and the capital employed in the district has not the same earning capacity as before, though something approaching a balance is struck by what has been accomplished within the works. The average business per consumer, through the operation of the prepayment system, is smaller than formerly; and among the old consumers, the incandescent gas-burner has reduced the average of the accounts. It was only a year ago that Sir George Livesey was telling the proprietors of the South Metropolitan Company that inquiries had shown that 80 per cent. of the consumers were employing the incandescent mantle more or less; and among the accounts of those consumers who had partially adopted the mantle, it had been found that the consumption of gas was reduced, on an average, about 21 per cent. Until the 20 per cent. remainder of consumers, and the whole of the burners of the 80 per cent., have been converted to the scientific system of utilizing gas, the period of transition for this Company from one form of lighting business to another will not have been completed. And be it remarked, that the period of greatest activity in this consumption reducing change has been with gas at the very low price (for London) to private consumers of 2s. per 1000 cubic feet. In this connection, it is also noteworthy that the public lamps in the Company's district are rapidly approaching the end of their conversion to the incandescent system. The number of incandescent burnered street lamps is now 22,362; being an increase of 512 compared with the December half of 1905; and of the total of 23,128 lamps, only 766 are on the flat-flame system. Contrasting the same periods, there was a diminution in the gas consumption of the public lamps of nearly 10 million cubic feet, though the increase in the total number of lamps was 349.

Under such circumstances as those presented in the foregoing paragraph, it is surprising that the financial working results of the Company have kept as level as they have done over the past few years. Under the circumstances, too, a slight decrease in consumption is nothing to mourn over, in face of the ever-growing use of the incandescent mantle, and especially considering the conditions of the half year. The actual decline in private consumption was about 16 millions; and this was a decline from a total private consumption in the corresponding half of 1905 of 5,874,527,000 cubic feet. But when we look at the receipts for gas, the period of the half year during which diminution took place is seen. The receipts from gas used for private and industrial purposes in the Michaelmas quarter amounted to £229,204, which was a shortage, compared with the corresponding quarter of the December half of 1905, of £3111. As the receipts for privately consumed gas in the whole half year (£575,939) were only short by £2239 of the second half of 1905, it shows conclusively that it was during those abnormally hot and light weeks of the summer (when everybody desired to minimize as much as possible controllable sources of heat) that the loss on the half year arose, and that, in the second quarter of the half year, there was recovery of the loss of the preceding three months by nearly £1000. Despite the extraordinary atmospherical character of the half year—in great heat, short hours of darkness, and little cold until the close—with dearer coal, sluggish markets for tar and ammonia, and heavier rates (nearly £5000 more), one thing so balanced another that, in the final outcome, we have a small financial improvement on the second half of 1905. The balance of the revenue account (£191,226) is better by £3311; and the net deficiency on the amount required to pay a 5½ per cent. dividend is £15,313, compared with £16,616 in the second half of the previous year. In other words, the deficiency is less by £1300. In view of the difficulties and repeated deficiencies in profit, the Directors have shown a laudable persistency in maintaining the 2s. price; and the consumers ought to be very grateful to them. Prognostication as to the future maintenance of the price is impossible, in view of the serious menace of higher coal prices. About the additional demands of coal owners, the Directors have something to say in their report; and attention is drawn elsewhere in these columns to their advice that a united front should be presented by the gas industry to unreasonable prices. The gas industry will be curious to know what, in present circumstances, should be regarded as "reasonable" prices.

Compensating the deficiencies, in considering the general position of the Company, are several interesting features in the report and accounts. The connections of the Company continue to expand; and some £45,272 of additional capital has been required for mains, services, meters, and stoves. Some 14,400 more consumers (chiefly prepayment ones) have been added; 13,358 more cooking-stoves have been fixed; and gas-fires, gas-engines, and other industrial appliances for using gas have been supplied. Another indication of the expanding scope of business is found in the £3098 increase in the receipts from meters and stoves. It is in the extension of business, favourable markets, and economies, that financial improvement in industry has to be looked for. But in a business where economical working has been kept at a high pitch, and there has been strict regard for detail, there is not the same room for striking improvement. But there is the satisfaction that benefits have long been enjoyed. Nevertheless, though the expenditure for coal in this Company has increased by £23,684 (owing to higher cost), the consumption, by pushing improvement in working a little farther, was diminished by 8841 tons, while the output of gas was but a shade over 12 million cubic feet less than in the corresponding period of 1905. The higher level of yield per ton has consequently saved the Company a substantial additional expenditure on coal. Purification costs are again down by £4884; and carbonizing wages have been lessened by nearly £13,000. It must also be pointed out that, though £17,726 extra was obtained from coke, it was on a largely-reduced quantitative sale; and in considering the lessened revenue from tar, it will be observed that there was a smaller quantity used and sold. A further peculiarly pleasing feature about this Company, which serves to assist in maintaining the strength of its position, is the fact that of 14,804 proprietors, 12,382 are identified with the Company either as consumers or employees—8263 being consumers, and 4119 employees. The Company have a reserve fund of £178,396; a renewal fund of £25,333; and an insurance fund of £106,737. Inspected, therefore, from all points of view, the Company have great inherent strength to enable them to combat the drawbacks that will come upon them (as others) from external causes. The coal and tar markets, and the unduly high assessments, are the clouds. The assessments are under appeal; and Sir George Livesey and his co-Directors will not fail to severely contest the other threatened and present disadvantages.

Economy in Municipal Gas Production.

All too little consideration is given by our civic governors to the ultimate effects of the courses in policy that they pursue. We hear, in effervescent language, of what is being done to benefit the ratepayers in the present. But whereas the effects of the so-called benefits are often as transient as the language in which they are glorified, a different policy might result in more enduring and expanding advantage, by the promotion of the common prosperity. Prosperity begets prosperity, but only when it is properly nurtured. If it is left to take care of itself, there will be a gradual decline until, in all probability, there will be actual extinction. The degree of prosperity of industry depends largely upon the generous conditions of many necessary contributory services. Gas is one of those services. A cheap gas supply is largely instrumental in assisting industrial prosperity; and industrial prosperity brings affluence and comfort to communities. And the homelife of communities is made in its every part, even so to speak to its nooks and corners, the more tolerable by cheap service in this respect. There is vast and almost perplexing interfusion between all these things. But many municipalities ignore consequences in their passion for present show, for prosecuting extravagant schemes, and for securing a little volatile applause. Those who applaud do not think. Moreover, in giving play to their passion in this way, our modern local rulers often confer benefits upon those who have done nothing whatever to contribute to, or to deserve, them.

There was a function at Widnes on Tuesday last; and at

that function was Mr. Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee. On the face of this, there is nothing peculiar; but the purely accidental combination of place and person sets one thinking of the question of the beneficiaries of economy in gas production when production is under municipal management, and the right and the wrong of their participation. Widnes furnishes the example of the benefits of economy in municipal gas production being utilized to serve the best and widest interests, and so to yield good to the greatest number. Manchester furnishes the example of a dearer gas supply; a proportion of the difference in price being due to a sum of about £1000 a week that is extracted from the pockets of the gas consumers—poor and rich alike—and scattered broadcast, benefiting in largest degree those who are not gas consumers, and therefore have not done anything, willingly or unwillingly, to contribute to the profits. Widnes itself was not always in the favourable position that it now occupies in regard to its gas supply. The antithesis of the present condition is found in the days before the advent of Mr. Isaac Carr as Engineer and Manager of the gas and water undertakings. Capital was then high per unit of output; and the price of gas was not at anything like the present inviting figures. Mr. Carr is an economist. The weak point of the gas undertaking was found upon his appointment; and countenanced by successive Committees, the process of whittling down capital per million cubic feet of production has been going on simultaneously with the improvement and extension of the works, in preference to the lavish making of profits, and their distribution among all and sundry, whether or not they have contributed to their making.

What is the result for Widnes? Through this growth from the patient prosecution of the set policy of the past, through favourable surroundings in regard to the procuring of raw material, through the prosperity of the industries that the service of cheap gas has helped to encourage, through the consequent day demand being equal to, sometimes in excess of, the night demand, and through the resulting (complying with the limitations of daily life and work) full-time employment of capital, gas is now being supplied in Widnes at 1s. 3d. and 1s. 1d. per 1000 cubic feet for ordinary purposes and 11d. for motive power, which last-named figure has even caused the borough's own commodity to be consumed for heating in moulding shops in preference to producer gas. These conditions that have fostered the cheapening of gas, and made the exceptionally low-priced supply available, would not have been created if over the past four-and-twenty years profits had been distributed in rate reductions, instead of being utilized in a manner that bestows the greatest possible benefit upon consumers in just proportion to their patronage. Where the price of gas is kept up for the purpose of obtaining profits for rate reductions, as in Manchester, the greater the patronage that a consumer gives to the gas undertaking, the more does he contribute to the sum that goes to relieve the rates of not only gas consumers but others—and wealthy people too—who do not subscribe a halfpenny to this fund, which therefore represents an unjustifiable inequality in taxation. In other words, the greater the patronage at ordinary prices, the greater the tax. At Widnes, the contrary state of things prevails; and gas is distributed at prices that advantage all who use it. Above all things, it encourages industries that give large employment; and such industries have helped to place the gas undertaking in the premier position in regard to low price. It is an effect of mutual interest and assistance. Municipal trading in any commodity can only be defended by the supplying of the community at the lowest possible paying price.

Therefore, at Widnes (we are dealing here solely with municipal and not company management), industry and the inhabitants generally are the beneficiaries of the economy that has produced the low prices. The more that economy actually produces reduction of price, the greater is the elasticity given to the gas business, and the greater the benefits bestowed. The Manchester gas undertaking has conferred benefits upon the gas consumers of all classes; and could it divest itself, as Alderman Gibson desires, of the encumbrance of a contribution of £1000 a week, or about £50,000 a year, to the reduction of the rates, still greater advantage would accrue to industry and to the consumers generally. The poorer class of consumers are actually paying 4d. per 1000 cubic feet more than there is any occasion for them to do. And part of this 4d. is going into the pockets of rich people who do not subscribe anything towards the making of the profits. There is something defective in a municipal trading system that permits of the infliction of such injustice; and it ought to produce a feeling of shame and revolt. Among the beneficiaries of the economy practised in the administration and technical operations at Manchester, are the electricity consumers, who do not contribute anything towards a reduction of the rates of the greater proportion of the population of Manchester who are gas consumers. Alderman Gibson is not the man to lack illustration to back his argument. He has listed the names of 21 electricity consumers in Manchester who do not consume gas at all; and yet the rates of these 21 electricity consumers are affected by the sum taken from the Gas Department to the extent of £1114 a year. We ask again, Where is the justice of such a condition of affairs in municipal trading? The Manchester gas undertaking has its elasticity diminished to the extent of the £50,000 a year or so taken from the consumers. Better by far allow both the gas and electricity undertakings to have full latitude, within paying bounds, in the competition one with the other; and then there must follow the development of advantageous effects, the distribution of which is directed, as at Widnes, by a law that has no association with injustice or with indirect or inequitable taxation.

There are just a few words to add, referring more particularly to the object of the function at Widnes. It was the inauguration of the, so far as we are aware, first four-lift holder erected on the Gadd and Mason system of spiral guiding. Mr. Carr has had the courage to go one lift higher than anyone else; and this is expressive of confidence in the invention. He had something to say upon the economy of this form of structure, and upon the low price, for a million cubic feet holder, at which the town had obtained this one. It works out to about £8 per 1000 cubic feet. The Corporation were, of course, fortunate in the time that the contract was placed. If they were giving out the contract now, in view of the enhanced prices of material and labour, the cost might be anything between 10s. and £1 more per 1000 cubic feet. Of course, the greater weight in a holder with guide-framing would cause the cost to be proportionately higher.

The Gas Coal Market.

The outlook in the gas coal market is, at the moment, anything but conducive to the peace of mind of gas administrations; but there is reason for urging that panic-stricken negotiations should be avoided, as this would only strengthen the hands of the coal owners, and have a mischievous effect throughout the coal contract season. A similar warning was uttered by Sir George Livesey at the beginning of last year; and he then suggested, if he did not actually prophesy, that the comparatively small additional price the coal owners were at the time asking was only the beginning of greater demands, which might mean a return to the prices that ruled in 1900-1, if there was not cohesion in the gas industry in resisting the imposition. What was hinted might be, has very largely come to pass. Quotations are considerably higher than those at which contracts were entered into in the early part of last year; and there are ominous rumours as to what is going to be done to compel coal owners to draw a defined advance per ton from gas undertakings. Therefore, there is cause, as Mr. Corbet Woodall said at the meeting of the Gaslight and Coke Company last Friday, for some anxiety as to the cost of coal in 1907-8. "Prices," he added, "much in excess of those of last year have been "asked, and in some cases given, for new contracts; and "it is impossible to prophesy with any certainty what may "happen."

The northern coal owners were last year the greatest offenders in demanding and commanding increases in price for gas coal in excess of what was justified by the flux of prosperity in the iron and steel trades and the textile industries; and the Midland gas coal owners, to the chagrin of the Northern owners, secured some additional highly remunerative contracts that have not customarily passed into their hands. These recently won favours do not appear to have balanced judgment, or to have induced a policy that would enable the Midlands to secure and retain a larger share of the gas coal business than in the past. They are now, report has it, taking concerted action, to raise and maintain prices at the higher level at which quotations at present stand. But where there is concerted action in trade, it is rarely that it is so complete and sound that there are

not to be found owners who are in the position to, and will, sell below the prices of the combination. We have heard of coal that has been contracted for below present quotations, which are anything between 1s. 9d. and 2s. 6d. in advance of last year's prices; but, on the other hand, there are already instances of undertakings that, for one reason or another, have had to pay 3s. per ton upon the prices at which they—perhaps fortunately for them—made their purchases a year ago. There have also been certain corporations in the North who have been "feeling" the market; and at suggestions of 2s. increase, they have stayed their hands. Anyway, the prices that are now being quoted are bringing us perilously near the level of 1900-1, when in so many cases the gas consumers had to suffer an increase in the price of gas. We do hope, however (as Mr. Woodall remarked on Friday), that nothing short of absolute necessity will induce any augmentation of the prices of gas.

It cannot be denied that the conditions of trade have created an enormous demand for coal; and the removal of the 1s. per ton export duty has brought from abroad a considerable rush of orders. There is also the higher wages that the miners are now receiving, and their shortened hours. These factors constitute a situation that must inevitably produce a somewhat higher price for coal for gas manufacturing as well as other purposes. But it is a singular thing that the gas industry should always, among the coal buyers for industrial uses, be the seat of the highest pinnacle in prices during booms in trade prosperity, or when other incidental circumstances furnish excuses for inflating prices. Yet from no other industry do the colliery owners enjoy such regular and increasing demands; but their gratitude for this is curiously expressed. The conditions of the present have certainly hyperbolical representation in their views as to prices. Rumours have been started that the colliery owners are being in this matter largely coerced by the Miners' Federation, who threaten that, if owners are found underselling gas coal, those owners will have their men withdrawn. Another suggestion that has been in circulation, is one that we cannot think has been seriously conceived. It is that the extended and extending use of gas-stoves has the effect of reducing the rate of increase in household coal; and that the only way for coal owners and workers to get something additional out of the householder at these times, in respect of his greater use of gaseous fuel, is through the price of gas coal. But against the rumours as to pressure from the Miners' Federation, must be set the working combinations among the colliery owners. There will, of course, be as great a resistance as possible to the excessive grasping of the owners at the present time; and, among other things, carburetted water-gas plants will again be brought into full swing. In the report of the Directors of the South Metropolitan Gas Company, there is also a repetition of Sir George Livesey's suggestion of last year, that there should be united action in resisting the extortionate prices of the colliery owners. The report says: "Instead "of acting as isolated units, they [gas undertakings] should "act unitedly, and refuse to pay unreasonable prices such "as those given by the Copenhagen Corporation, who have "chosen the worst time of the year for making their con-"tracts." To present a united front, someone must make a move; and there should be conference over the matter by the heads of both Gas Companies and Gas Committees, to discuss what, if any, action can be taken. There is combination, conference, and agreement by the coal sellers; and why not on the part of buyers? Therefore, who will make the move for conference from the gas industry?

When dear fuel has done its work in oppressing the industries of the country, and colliery owners are eager to net the orders of the gas industry, their views as to what at this time constitutes a fair advance will receive, from buyers of gas coal, due consideration at the lower end of the scale of prices.

Disposal of Gas-Works Surpluses.

The familiar question of the relief of the rates by the transfer of profits from gas-works, has cropped up in an unusual fashion in two places within the past few days; and, curiously enough, in each case the trouble was of the same character—there was a desire to assist the rates out of the gas-works surpluses, which there was found to be some difficulty in satisfying. The more interesting discussion has occurred at Spalding, where the Local Government Board Auditor has brought the matter to a head by surcharging two members of the Urban District Council to the extent of £1000; these gentlemen having been guilty of signing a cheque by which this amount was transferred from the gas undertaking to the credit of the general district rate account. It will be seen from the reference to the matter which appears in another column that there are special circumstances affecting the question at Spalding; and although it is, of course, unlikely that the two councillors concerned will eventually suffer by reason of the surcharge that has been made, there may be some trouble involved before the matter is satisfactorily adjusted. It is reported that already application has been made to the Local Government Board, who have stated in reply that they see no reason to interfere with the exercise by their Auditor of his discretion. It will be noted that until lately the Board held that the profits from the works must be spent in improving the undertaking or reducing the price of gas; and in order to secure power to relieve the rates with any surpluses that might accrue, a Provisional Order was secured in 1903. In the following year, the Auditor allowed the application of £900 odd in aid of the rates; but on the next occasion, trouble arose, the Auditor having found that the Order contains a clause which, as he holds, prevents any part of the profit being appropriated to the rates so long as a "lighting rate" exists at all. The present lighting rate is 6d. in the pound; and whether it is extinguished or the district rate is reduced, seems to be largely a difference of account. The gas consumers do not appear to be concerned more than other ratepayers; for it is to be noted that the price of gas—2s. 6d. per 1000 cubic feet—is below the maximum figure at which the Order allows of profits being devoted to other purposes than a reduction of price. The second case is at Congleton, where the Town Council have sought (unsuccessfully) to obtain the Local Government Board's consent to the issue of a Provisional Order so amending the Corporation's existing Act and Order as to allow them to devote the surplus gas revenue to the borough fund or general district rate. The reply of the Board was that "a sufficient case had not been made out" for the Order.

An Omission from the Municipal Socialists' Programme.

"The Times" last Thursday contained the third of a series of articles on the work of the London County Council, and in the course of it the writer gave *in extenso* the programme adopted by the Council of the Metropolitan Radical Federation in 1891 and that of the Independent Labour Party which has been put forward as a manifesto in view of the coming Council election. The two programmes are on very much the same lines; but they differ in one particular which has a certain amount of interest for our readers. The programme of 1891 contained eighteen items, one of which was "to obtain powers to take over the plant, &c., of gas companies at a valuation." In the programme which is intended to influence the ratepayers next month these words are conspicuous by their absence; and the writer is curious to know why it is, seeing that it is proposed that the Council shall take over the docks, supply electricity, own all means of public locomotion, supervise and finance the hospitals, acquire dairy farms and mines, sell milk and coal, and "organize a system of central and local markets and slaughter-houses in conjunction with the Borough Councils." He answers his own query, and says it is simply because the workmen employed by the South Metropolitan Gas Company are shareholders in the concern, and consequently the proposal to deprive them of their property would be resented. Only those things which belong to somebody else are to be municipalized for the benefit of "Labour."

Electrified Photometry: The "Electrician's" Error.

On a succeeding page, we further discuss the section of the paper that Mr. C. C. Paterson read before the Institution of Electrical Engineers dealing with photometrical flame standards; and here we wish to correct a mistake on the part of our contemporary the "Electrician," which may lead to misapprehension. In the opening of his paper, Mr. Paterson alluded to the courtesy of the Institution of Gas Engineers in permitting the results of the tests on flame standards to be published in his paper for the first time. Mr. Paterson knew quite well that the acknowledgment he made was due. The "Electrician," however, is of contrary opinion. In an editorial paragraph, it says: "The 'JOURNAL OF GAS LIGHTING' seems to think that the courtesy was somewhat

misdirected, as some of the speakers in the discussion showed their contempt for flame standards. Although we do not agree with this point of view, we think it might be held that the permission to publish such results is altogether unnecessary, as they have been obtained by the application of public funds." The experiments were made for the Institution of Gas Engineers; and, in the accounts presented at the last annual meeting there appeared among the charges against the Special Purposes Fund, this item: "Standards of Light Experiments, £26 13s. 7d." We hope our contemporary will do the Institution of Gas Engineers the justice of giving equal prominence to correction that they have given to their mistake. In conjunction with this matter, the "Electrician" also thinks "that much might be gained by a greater exchange of courtesy between electrical engineers and gas engineers. There are many questions common to both industries;" and our contemporary sees "no reason why a joint meeting of the Institution of Electrical Engineers and the Institution of Gas Engineers should not occasionally be held."

Refractory Materials.

The best compliment that it is possible to pay to the reader of a paper at a technical meeting was accorded to Mr. A. N. Comely on Saturday by the members of the Midland Junior Gas Engineering Association—that is to say, his contribution was discussed at very great length. The subject of refractory materials may possibly not in the past have received the amount of attention which it deserves, in view of its importance to those engaged in the gas industry; but the Junior Associations, at any rate, seemed determined to do their share towards bringing it to the front—as witness the proceedings of the Scottish Association reported last week, and Mr. Comely's paper on "Refractory Materials used in Gas-Works," an account of which appears to-day. The preparation of a paper must always involve considerable expenditure of time and trouble; but this, of course, only adds to the credit which is due to those who undertake the task. But if the effort is great, it is—as, indeed, is the case with all well-directed effort—not without its reward; for the amount of research involved, particularly in connection with so complex a question as the one under consideration, must be of benefit to the author of the paper as well as to his fellow-members. Mr. Comely has proved himself quite capable of tackling a difficult subject; and the Association have shown themselves no less able to discuss it in a thorough and a very interesting manner. The paper, of course, dealt largely with facts; but at the same time there were in it points which afforded plenty of scope for argument. For instance, there was the question of the standardization of retorts, which met with a considerable amount of attention at the hands of the members; and another matter on which considerable difference of opinion was manifested was the suitability or otherwise for use in gas-works of Ewell bricks. In all probability the members of the Association will shortly have an opportunity for still further priming themselves on the subject of fire-clay, for they have been invited to pay a visit to the works of Messrs. George K. Harrison, Limited, at Stourbridge, where they will be able to see the process of manufacture and inspect the firm's mines and the various seams of fire-clay.

Manchester District Institution of Gas Engineers.—We learn from the Hon. Secretary (Mr. H. Kendrick, of Stretford) that the next quarterly meeting of the Institution has been fixed for Saturday, the 23rd inst., in Manchester. The programme will include—in addition to the ordinary business of the annual meeting—the address of the President (Mr. W. Prince, of Stoke-on-Trent), the completion of the discussion on Mr. George Stevenson's paper entitled "Experiences in Competition for Power," and the discussion of Mr. Edward Allen's paper on "High *v.* Low Grade Gas."

"Transactions" of the Institution of Gas Engineers.—We have received the volume of proceedings of the above-named Institution for the past year. In addition to the papers read at the annual meeting held in June, under the presidency of Mr. Charles Wood, of Bradford (whose portrait, as is now customary, forms a frontispiece to the book), with reports of the discussions thereon, and the other matter usually included in the volume, there is a translation of the report of the transactions and of the minutes of the proceedings at the first session of the International Committee on Photometry, held at Zurich in June, 1903, which were published under the supervision of the Société Technique du Gaz en France. This important appendix to the "Transactions" is followed by a series of abstracts of papers which appeared in chemical and other publications—mostly the "JOURNAL"—during the year.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 361.)

BUSINESS on the Stock Exchange was again very quiet all last week. Anxious regards were still being directed towards the cyclonic centre across the Atlantic; and the prevailing disposition of the doubting mind was to pursue a policy of masterly inactivity. At the opening, the tendency was tolerably fair; but this gave way in many lines. It was account week; and there was some hope that the settlement might be satisfactorily adjusted. As a matter of fact, two minor failures were reported. After this, things fell very dull; and the week closed with marked flatness in commanding markets—as Home Rails and Americans. In the Money Market, there was a good demand for Stock Exchange and month-end purposes, and rates were firm; easing off afterwards when requirements were satisfied. Discount was firmest at the close. Business in the Gas Market was fairly well up to the mark, though perhaps scarcely quite as active as in the preceding week. Movements were irregular; and changes of quotation were about as many in one direction as in the other. But the most sensational move was a sharp and sudden fall in Gaslight and Coke ordinary. This stock had been standing very well in the market—promoted by the Directors' announcement of the dividend and carry-forward, and confirmed by the half-year's accounts. The quotation had advanced well above par, and dealings as high as 101½ had been marked, when, quite suddenly, on Thursday, the quotation fell two points. This was followed next day by a fall of one more—stock changing hands more than once at 98. The explanation of this phenomenon appears to be that the market took fright at the rise in the price of coal. Coal is no doubt higher, and probably will not be lower yet awhile; but "panicky" movements are always regrettable. There were moderate dealings in the secured issues; the preference being done at from 108 to 109½, and the debenture at from 85 to 86. South Metropolitan was a little less active, but firm—transactions being between 128 and 129. The debenture was done at 84½ and 85. Rather more business was apparent in Commercials. The 4 per cent. changed hands at 112½, the 3½ per cent. at from 108½ to 110 (a rise of 1 in the quotation), and the debenture at 83¾. Not much was marked in the Suburban and Provincial group; but both Alliance and Dublins and West Ham preference had a rise. Brentford new was done at 204½, Brighton original at 236, British at 42¼, South Suburban preference at 125, Hastings 3½ per cent. at par, and ditto 5 per cent. at 120½. In the Continental Companies, Imperial advanced a point, with dealings at from 182½ to 184, and ditto debenture from 96¼ to 97. Union marked from 125½ to 127; and European fully-paid 24⅞ *cum div.* Among the undertakings of the remoter world, Bombay new was done at 5⅛ and 5¼, Buenos Ayres at 11⅝ and 11¾, Cape Town debenture stock at 97¼, Monte Video at 12, Primitiva at from 7 15/16 to 8 3/32, ditto preference at 5 7/16 *cum div.*, and 5 5/16 and 5 3/32 *ex div.*, and River Plate debenture at 96¾ and 97.

The closing prices are shown in our list on p. 361.

ELECTRIC LIGHTING MEMORANDA.

A Big Opposition to the L.C.C. Bill—Cheaper Electricity an Assumption; Heavier Rates a Certainty—The Wiring and Fitting Powers of the London Borough Councils—Municipalities and the Local Government Board—Cost of Cooking by Electricity.

WHO are up in arms against the London County Council electricity scheme? The question involves an answer that would occupy too much of our space; and so its opposite had better be put, and the inquiry made, Who are not up in arms against the London County Council scheme? The reply is, only those whose party names—Progressives and Socialists—are at the present time somewhat repugnant to the majority of London ratepayers; and of the Progressives, it is the large irresponsible section whose personal views on this momentous question would be of very little account, if it were not that they just now command the situation by numbers rather than by mental capacity. The County Council have this last week confirmed their resolution to proceed with the Bill; but there is an intelligent minority in the Council who are praying in most fervent spirit that the Council elections in March will see such a change in the dominant party that London will not be committed to the fearful rashness now contemplated at Spring Gardens, and encouraged by the Government. With that encouragement, the Progressive and Socialist majority of the Council do not care much for all the outside opposition that can be brought against their remarkable scheme. The only really effectual way of preventing the threatened great harm to London will be by the crushing out next month, by the ratepayers, of the present majority on the Council. Such an act would be hailed with the greatest satisfaction almost everywhere where prudence exists. Meanwhile, the Metropolitan borough councils, the outside local authorities, ratepayers' associations, companies, and trade organizations are preparing themselves for serious opposition if the Bill does go forward. The immense financial responsibility that this County Council monopoly scheme would involve is recognized as a real peril on all sides; and the inanities that have been poured from platforms recently as to electricity being

the one great thing needed to stimulate industrial life in London, have not succeeded in dissipating fear.

The idea that the manufacturing industries of London are craving for electricity is as much an assumption as is the whole of the rest of the case that is put forward by the London County Council in this regard. The present suppliers by organizing their forces can do all that is required, without bringing greater burdens upon the ratepayers. The Finance Committee of the County Council and even the propounders of the scheme fully admit that there must be a charge on the rates for many years. Excessive rates have made London uninhabitable by some considerable representatives of industry; and yet here we have the County Council submitting to the manufacturers a proposition—without taking the trouble to find out how far their assumptions as to power business are well-founded—that might have emanated from a lunatic asylum. "We are proposing," the Council submit in effect, "to supply manufacturers with electricity (if they will have it) at, we fancy, a cheaper rate than they can get it for now; but in order that we may see whether or not we can do this, we intend spending many many millions of money, propose to acquire the existing undertakings, and shall have to add something more on to the rates." That is the bare proposition. And we may be permitted the opinion that if cheaper electricity (ignoring for the moment the assumption as to cheapness) is to result in heavier rates, the manufacturer would rather be without the cheaper electricity. Cheapness of supply is only one thing the manufacturer has to consider. Heavier rates, constancy of supply, the cost of tearing out existing motive power plant and replacing by electric motors, and the competition of ordinary distributed gas, and of suction gas plant, must all come into the reckoning. The County Council are imagining a vain thing if they harbour any belief in such a scheme as they have in contemplation sweeping before it all other forms of motive power. Now, there are electricity undertakings in parts of London doing special business in electricity for power purposes at a cheaper rate than the County Council are proposing, and yet they cannot succeed in capturing the motive power business. In brief, in the hands of the Council, the scheme is one for creating heavier rates, for making London still further uninviting for industry, for retarding electrical progress, and for producing an instance of an enormous commercial failure. If the Bill proceeds, and there is a fair field and no favour given to the combatants, there will be a grand fight over it. But in the present Parliament, we fear, after the experiences of last year, as to the fair-field-and-no-favour part of the essentials to a grand fight. It is noticed that the Bill is to be handled by the friendly Commons at the outset. The Council would hardly care to risk the Lords until the Lower House has done all they can to strengthen the Council's position.

Certain of the Metropolitan Borough Councils are taking steps to put into force the wiring and fittings powers given them under the London County Council (General Powers) Act of last session. In the case of Southwark, it is thought advisable that the number of lamps wired "free" should be limited to six, that slot meters should be used, and that the standard rate of 4d. per unit should be charged, to include lamp renewals, excepting breakages due to carelessness. As an alternative, hire purchase is suggested. The Stepney Borough Council are also moving. Ratepayers, especially the large ones, will not forget that this wiring and fitting business is to be done on a paying basis, and that separate accounts are to be kept. These accounts will need to be carefully scrutinized to see that the charges made actually meet expenditure. Attached to the report before us referring to Stepney, incidental mention is made of the fact that one large consumer has intimated that, unless the Council take some steps to carry out such alterations to his installation as will effect considerable economy in the consumption of energy, he will have no alternative but to cease taking a supply from the Council.

Municipal electrical engineers are feeling very sore over the depth of interest that the Local Government Board now take in the affairs of their undertakings when applications are made for additional loans. The depth of interest is very embarrassing and inconvenient; and it would be more in consonance with the views of the engineers if the Inspectors of the Board would conduct their examinations in a more superficial manner. Instead of feeling sore, there ought to be gratitude; for the sole object of the Board is to place municipal electrical finances on a perfectly sound basis, and above suspicion. It is not the fault of the Board that a more rigorous supervision on their part has been called for. There have in the past been some pretty severe strictures by the "Electrical Times" in regard to the muddled finance that has been disclosed in certain east-end boroughs, at Brighton, and elsewhere; and lately in the same quarter there has been a series of articles in which the Board and their Inspectors are railed at in most luxuriant style in respect of their searching and most uncomfortable investigations. Those very investigations are the ones that have brought to light disgraceful conditions of affairs that are not creditable; and, therefore, instead of reproach there should be praise. Civic life does not begin and end in a municipal electric-light undertaking. There are the ratepayers to be considered, the greater proportion of whom are not users of electricity. The paramount duty of the Local Government Board is the protection of the ratepayers by exercising the control and regulating powers that Parliament has conferred upon the central authority. The gravamen of the charge against the Board is that they are too diligent in unravelling mysteries and making plain and straight the rough places in municipal finance. But they cannot be accused of exceeding their powers. The Board's well-meant advice, that local authorities should practise more economy in public lighting, is also keenly resented in a lengthy diatribe. The new proposition is advanced that, if a gas company can do the public lighting for £1200, and it cost £2000 by electricity, the profit that is derived from the latter merely goes from one municipal pocket into another, so that the ratepayers really have no ground for complaint. Those ratepayers who are not electricity consumers, but are patrons of the gas company—and who know that the company under the sliding-scale of price and dividend cannot get an increase in the latter unless they distribute among the consumers in the shape of a reduction in price about seven times more than the amount required for the extra dividend—will hardly see the force of the contention; for they will have to bear their share of the extra cost of £800, and get no benefit from it. If all the ratepayers were electricity consumers, there might be a little more reasonableness in the proposition, but not much, seeing that, although electricity causes the total cost of public lighting to go up by leaps and bounds, the electricity department cut the charge they make as fine as possible—in some cases the lighting is actually done below cost, to the detriment of either the private electricity consumers or the ratepayers—in order to get the lighting from the hated rival. In the economics of municipal expenditure, £800 less taken from the pockets of the ratepayers is a not inconsiderable saving. It is a roundabout way of getting an additional £800, to take it from the ratepayers for public lighting (if an amount £800 less would suffice and be remunerative), put it to the credit of the electricity undertaking, and then have it transferred to the public exchequer, to help to assist in ministering to the rampant excesses in municipal administration in the present day. The argument of our contemporary has not the merit of strength.

There are very few reliable statistics published regarding the cost of cooking and heating by electricity. Those that have been made public are generally nothing more than manufacturers' estimates, which, like carbon filament lamp ratings, decline to be confirmed in practice. In the year 1897, Professor Jackson, of Pennsylvania State College, showed that cooking by electricity cost about five times as much as cooking by gas. Since 1897, the prices of both gas and electricity have been reduced considerably, and electricity has also been given, for these purposes, the advantage of a differential price, in order to secure for electricity stations an additional source from which to fill up the valleys in the load curve. But up to the present time, the contributions of cooking and heating are not overwhelming the station engineer. Still the cost has come down, as is brought out in an article by Charlotte D. Seaver, B.Sc., published in the "Clarkson Bulletin." The article is really a record of results attained in a series of experiments in electrical heating and cooking as conducted in the Home Economics Laboratory of the Thomas S. Clarkson Memorial School. Though these results were under American conditions, the character of the information accords to it a value for those interested in the question. In the experiments, similar articles of food were cooked in electricity, coal, gas, gasoline, and kerosene ranges; the fuel in each case being weighed and measured. The cost of electricity was on the basis of 2d. per kilowatt-hour, coal 28s. per ton, gas 4s. per 1000 cubic feet, gasoline 7½d. per gallon, and kerosene 7d. per gallon. Between 2s. and 3s. would be the price of gas in most towns in this country, and in a few below 2s.; so that allowance must be made for this great difference in price. At the same time, it must not be forgotten that in many places in this country electricity is now being sold for cooking at a price—frequently 1d. per unit—that really cannot pay for such a small intermittent service. However, in these experiments—with the buying prices as named for the fuels, in the same kind and character of cooking operation, the time in each case being based on one hour—the relative costs were: Electricity, 2·064d.; coal, 1·83d.; gas, 1d.; gasoline, 0·6d.; kerosene, 0·55d. So that it is seen that electricity was the dearest of all the fuels. Besides, in the experiments, there was exercised the utmost care in using electricity—such care as it could not be expected would be observed in the kitchen, or if expected there would be disappointment. Our informant in her statement says that, when baking, the current was turned on from 20 to 30 minutes before the articles to be baked were placed in the oven, so as to allow for thorough heating, and it was turned off again 10 minutes before the baking was done, as the oven would remain hot long enough to complete the operation. Time is a consideration in cooking; and using electricity for this purpose, a large amount of time appears to be absorbed compared with the gas-oven. For example, in the baking of four apple pies, only 7 inches in diameter, the time required to raise the oven from cold to effective cooking temperature was 25 minutes, and the operation itself took 35 minutes, so that an hour was expended in cooking these four *petite* pies. In the reprint of the article in the "Electrician" (we do not know whether the figures were given in the original print), no mention is made of the time occupied for the same operation with gas. The conclusion of the writer is that cooking by electricity costs, on the prices quoted, double the amount that gas would do; and that this fact, together with the initial cost of the cooking apparatus, "would appear to forestall its general adoption at present." The points as to time, reliability, and repair have also to be taken into account; for there has to be considered not only the bare cost of the electricity to the householder, but the ruffling of tempers through disappointment, the continuity of service, and the "extras."

THE PHOTOMETRIC ELECTRICIAN.

We ventured last week (*ante* p. 266), when discussing Mr. C. C. Paterson's investigations on the influence of atmospheric conditions on the value of flame standards, to question the propriety of delegating such research work to an electrician, on the ground that it involves, for its proper execution, chemical analyses of a precise and special nature, to make which one who is primarily an electrician would scarcely be competent. Moreover, we indicated that, whether for the foregoing or for some other reason, Mr. Paterson's investigations were decidedly unsatisfactory in so far as they related to the influence of atmospheric conditions. Naturally he is more trustworthy in his study of electrical standards of light; but before they are discussed, his methods of photometry may appropriately be referred to, especially as it would seem that they are, in some measure at least, responsible for the dislike Mr. Paterson and his electrical *confrères* obviously show to flame standards of light.

Mr. Paterson has used a bar photometer, equipped with the Lummer-Brodhun head, in his studies of flame standards. He does not directly compare one lamp with another, but each in turn with one of the large bulb electrical standards which, he says, now form the principal working standards of the National Physical Laboratory. If the flame standard under comparison is, for instance, a Harcourt lamp, he sets it up vertically at one end of the photometer bench, lights it and throws open all doors and windows of the room, and allows it to burn for half-an-hour under these conditions. The electric comparison lamp is then brought to its proper voltage, and all doors and windows are closed. Some twelve or fourteen readings are made during the first ten minutes after the room has been closed. As regards the accuracy of photometric observations under these conditions, Mr. Paterson says that much depends upon the condition of sensitiveness of the observer's eye on any particular occasion.

It would be difficult to frame a more damaging indictment of the photometrical work—so far as flame standards at least are concerned—conducted at the National Physical Laboratory, than these naive confessions of Mr. Paterson. The photometer-room is clearly devoid of adequate ventilating arrangements; and consequently comparisons are limited to a period of ten minutes immediately following half-an-hour's exposure to the external atmospheric conditions. On one occasion the observer's eyes will have been dazzled immediately before by brilliant sunshine without; on another, he will shiver in the frosty air so freely admitted; and on a third, he and the apparatus will be bedewed by the deposition of moisture from a saturated atmosphere. Bedazzled, benumbed, or bedewed, he will certainly not be physically capable of making accurate photometric observations within ten minutes. Moreover, upwards of an hour will elapse before a second flame standard can be tested under these arrangements; and appreciable changes in atmospheric conditions may clearly occur within this period. The Lummer-Brodhun photometer head again is a very clever optical device; but it is complex, and the opinion of many observers is that it is less sensitive than other and simpler arrangements. Mr. Paterson would find the report of the Dutch Photometry Committee of 1893 instructive in this connection.

The Harcourt lamp is tolerably capable of withstanding rough usage; but we doubt if it will remain unaffected under repeated half-hourly exposures to the winds and dews of heaven. Open-air treatment is likely to prove prejudicial rather than beneficial to it. Mr. Paterson, however, in addition to this drastic procedure, regulates the air supply to the pentane saturator by a novel method, which may conceivably modify the value of the standard. He affixes a piece of india-rubber tube to the air-inlet cock, and regulates the flow of air through it by an ordinary screw clip. We are not told the length of the piece of tube; but if it is short, the regulation must be effected with the observer in close proximity to the lamp, if long, the tube must appreciably alter the "pull" of the air-gas syphon. In the latter case, the air is drawn from another part of the room, and the effect of variations in the composition of the atmosphere could not then be satisfactorily observed. The Harcourt lamp is used in gas photometry with other means of regulation; and Mr. Paterson does not say why it is he has discarded these in favour of his own device.

This brings us to our main objection to Mr. Paterson's work on this lamp—viz., that it has not been carried out when the lamp has been burning under normal conditions. If the National Physical Laboratory desires to adopt this flame standard for the rating of secondary standards, it should use it under the conditions in which it has been used for gas testing in the Metropolis since 1898, and in many other towns for a shorter period. These conditions are well known; but Mr. Paterson's paper leaves it more than doubtful whether he has conformed to the following among others: Use in a properly warmed and ventilated room, with the burner at a particular height above a table-surface, and not less than a certain distance from any wall of the room, and with the height of the flame regulated by the outlet cock of the saturator, or the conical damper on the inlet-cock. We are not arguing that these are ideal conditions; but they are those under which the lamp was originally, and is now, used as a standard of light, and any departure from them may result in an alteration of the value of the standard. We do not gather that the Institution of Gas Engineers desired Mr. Paterson to modify the Harcourt standard, or to give it a new value; but his paper raises grave doubt as to whether he may not have unwittingly, by altered conditions of use, have wrested it from its original standard value. In that event, the value of the secondary electric standards which "now form the principal working standards of the National Physical Laboratory" seems more dubious than ever.

PREPAYMENT PROTECTION.

Effect of a Strong Money-Box.

The law relating to the ownership of money deposited by consumers in the boxes of prepayment meters is in a very unsettled state; and until the matter is decided beyond further dispute, no one can positively say whether the money in a prepayment meter box is in the custody of the consumer or of the gas company or corporation gas committee to whom the meter belongs. Only recently, in Metropolitan Police Courts, there have been decisions, and expressions of opinion on the point from the Bench, that are diametrically opposed. Notwithstanding that a prepayment meter agreement of the Gaslight and Coke Company says that "a consumer shall be accountable to the Company until the money shall have been collected by the Company's officers," and that if "from any cause" the amount of money in a prepayment meter-box is found to be less than the sum which ought to have been there, &c., Mr. Biron, at the Old Street Police Court, declines—where a meter has been robbed, and it is not proved that the consumer himself has committed the wrong—to make the consumer responsible for the stolen money. In another case at Highgate, where a consumer had left a house without giving the North Middlesex Gas Company notice, and the prepayment meter-box had been forced and rifled (although there was no actual decision in this case), the Chairman of the Bench expressed very similar views to those to which Mr. Biron gave utterance a few days later. The Chairman in the North Middlesex case, pointed out that the prepayment consumer had to pay for his gas before it was used; and the Company would not let him have gas until it was prepaid. The meter, he also contended, was not the consumer's, and the Company locked the money-box up, and so took all control out of the hands of the consumer.

Now the decision and the expression of opinion here referred to open up a vista of enormous unpleasantness, trouble, and risk on the part of gas suppliers; while, at the same time, there is much to be said from the consumer's point of view in favour of the cited opinions. If these opinions are maintainable in law—despite agreements that, *primâ facie*, one would have formerly imagined left no loophole for escape from responsibility on the part of the consumer—then wherever there is a robbery of a meter, the gas suppliers will have to discover the perpetrator before they can have any possible redress. Moreover, such a condition of affairs would, it is to be feared, lead to an increase of plundering on the part of unscrupulous consumers, who would evade any responsibility by merely declaring that the robbery was the work of some unknown person. Discovery and onus of proof would, under such circumstances, rest with the gas suppliers. For them the position of this question is indeed a serious one.

On the other hand, there is something to be said for the prepayment consumers. Because such consumers are, as a rule, poor, they must not therefore all be treated as suspects. But being poor, in some cases, temptation is strong when poverty pinches. That is another side of the question; we are now on the point as to the ownership of the money in the box of the gas-meter. Looked at from the consumer's point of view, he has no property in the meter. The pence pass from his possession into something that is the property of the gas supplier. The company "protects" the money, after a fashion, by lock and key, and sometimes seals, as against the consumer. The consumer is in no way consulted as to the security afforded by the meter. The gas supplier alone has the determining voice as to what constitutes sufficient security; and the judgment of the gas supplier, the gas supplier holds, is sufficiently good to be binding on the consumer. But what does the very title of "prepayment" system signify? There can be no *pre*payment unless there is a transference from the possession of one person to another of the consideration for value to be received prior to its being received. The gas supplier, however, tells the consumer that possession of the money still rests with him; but the gas supplier puts a lock and key between the consumer and the money, and retains the key. Assertion and act are in such a case most difficult of reconciliation. The gas supplier, however, points out that he offers the gas consumers who so desire, certain special facilities on specified conditions; and if, by one of those conditions a consumer agrees to be responsible for the money in the box of the meter until removed by the collector, or until the consumer gives notice of his intention to quit the premises supplied, then such an agreement, even in the event of robbery, it would appear, ought to be upheld by law, although, in many cases, it would involve great hardship on those who buy gas by the pennyworth. Therefore, until it is properly placed beyond further legal contention, the question of ownership of, and responsibility for, the money in prepayment meters will remain a knotty and uncertain one.

Meantime, the subject is worth consideration from other important sides. The extensive use of the prepayment meter has proved two things, in addition to convenience and profitableness—that its existence is another temptation to frail humanity, and

that the resistant power of the money-box, as usually constructed, is practically at an irreducible point. The former directs the train of thought into considerations of ethical importance, and the latter as to whether gas suppliers are doing all they ought to do in protecting themselves and their consumers against temptation and against others breaking into houses for the sole purpose of plundering the accessible money-boxes of their prepayment meters. There seems to be little consideration as to moral obligations, though it has been said in a Law Court that prepayment gas-meters manufacture thieves. The gas supplier courts prepayment; but for security in most exposed places, he trusts to honesty and to an unsubstantial sheath for the deposited money. Reliance on such protection shows a generous belief in human nature.

A short time since, in conversation with Mr. Alfred Colson, of Leicester, he was very emphatic upon the point as to the moral obligations of gas suppliers in this regard; and he urged that they have no right to expose their poorer customers to temptation, nor to make their houses a mark for the house and meter breaker, who laughs at padlocks and paper seals while the money-box will readily yield up its contents by a little more or less gentle persuasion with almost any hand tool. Inquiry shows that it is this recognition of moral responsibility that has mainly caused the Leicester Corporation Gas Committee to adopt largely the strong, resisting money-box that has been designed by Mr. Colson for the purpose of protection—for the protection of the consumer as much as of the property of the Committee, and for the removal of tempting conditions as much as for the purpose of saving deposited money. The experience is that the new box has done all that was expected in these respects, and a great deal more. It relieves many of responsibility, and places more upon the money-box. Before leaving this question of moral responsibility, there is an interesting suggestion that may assist in driving the matter home. Mr. Colson, when he was considering the matter, kept, throughout one quarter, a map, upon which he placed a red dot for every meter that was violently pillaged. At the end of a quarter the map as we saw it looked much as though there had been a frightful epidemic in the district. If other gas engineers in populous districts would do the same, it would convey to the mind more than the daily knowledge of these occurrences, which are treated merely as passing incidents of the new form of business. Inspecting such a thickly dotted map, the question arises, Why is it that every one of the dots should represent a thief? The only answer can be that the prepayment meter money-box in its common form of construction, invites and readily lends itself to attack and robbery. And for that form of construction someone is responsible.

This being so, it is the money-box that needs attention; and it is a money-box designed by Mr. Colson that has had a splendid moral effect in Leicester. The box is a patent one; but the experience with it in Leicester to which we are about to direct attention has not been obtained by the enrichment of Mr. Colson by a single penny piece. It is only due to Mr. Colson to mention this, as he has been good enough to comply with a little solicitation that he should give, through the "JOURNAL," of his experience in this connection for the benefit of the gas industry. But before dealing with that experience, a few words describing the money-box are required.*

The box really consists of two parts—an outer casing of malleable iron, and an inner receptacle for the coins, made of tinned plate or sheeting. The upper part of the outer casing is further strengthened by inside ribs. The bottom of the outer casing is closed by a strong detachable piece which slides into recesses—being caught at one end by a lip on the outer casing, and fastened at the other end by a patent lock that Mr. Colson has adopted after trying several other patterns. This bottom closing piece is quite invisible to the eye, unless the meter is placed at such a height that the keyhole is discernible. This is an important point in the protecting influence of the box. The inner receptacle is held in position by the inner ledge at the bottom of the outer casing; and it is noteworty how dexterous the collectors get in manipulating the cover in its bottom position, and in dislodging and replacing the coin-box. The arrangement is adaptable to any type of prepayment meter; and, in fact, all makers of meters now supply it. In most instances, the box is affixed to the meter by bolts and nuts, with a stiffening piece inside the meter; and, in addition, there is a lip (or some other device) protruding from the money-box on to the face of the meter, so as to prevent anyone using an instrument in the attempt to forcibly disconnect the box from the meter. It is clear that a meter would have to be practically destroyed before the money-box could be detached. The reward is too speculative for so much trouble to be taken—even by a thief.

That is, in general terms, a description of the patent money-box which Leicester has found to be so beneficial. Now as to the results of the application of the new arrangement—to, at present, selected parts of the town and to doubtful cases. The following figures will show by comparison what an effect the box has had in diminishing thefts; and where there have been thefts recently, the thieves do not visit the same place a second time, knowing that they will meet with their new and invincible enemy.

The figures as they stand are eloquent in their lessons; but there are a few explanatory remarks to be made concerning them. It will, in the first place, be noticed that up to December last,

* An abstract of the patent specification appeared in the "JOURNAL" for Oct. 23 last, p. 251.

Prepayment Meter Thefts Before and After the Partial Adoption of the New Money-Box.

Quarter.	Cases.	Amount. £ s. d.	No. of Patent Cash-Boxes Fixed.
1905. July, Aug., Sept. . . .	306 ..	51 11 2 ..	0
,, Oct., Nov., Dec. . . .	288 ..	48 14 9 ..	0
1906. Jan., Feb., March . . .	270 ..	51 11 6 ..	0
,, April, May, June . . .	153 ..	25 19 0 ..	281
,, July, Aug., Sept. . . .	133 ..	24 3 7 ..	754
,, Oct., Nov., Dec. . . .	137 ..	22 5 2 ..	1575

Four weeks, January, 1906, £16 6s. 4d., 92 cases.
,, January, 1907, £6 8s. 9d., 42 cases.

1575 new boxes had been fixed. These are out of a total of upwards of 30,000 prepayment meters that are in use in the borough; and, as explained already, they have been fixed in selected places. When this is considered, it will be admitted to be an important point, as the reduced cases of robbery show the wisdom of the selection made. It is not proposed, until renewal or necessary repair gives the opportunity, to make any special provision for replacing the old form of boxes by the new where coin meters are fixed in the houses of a respectable class of consumer. In some streets there are never any robberies; in others, they are frequent. There have been nineteen cases (four empty houses included) where thieves have attempted to break open the new form of box, without success, save in two early cases where the meters were fitted with the original pattern of brass box with large top opening. But there has been no success with the later iron pattern boxes. It is believed that this has had an influence in impressing the plunderers that there are more of these boxes in use than there really are, and also that, when the boxes are recognized, the would-be riflers prefer not to waste their time fruitlessly, and so leave them alone.

Now as to the additional cost. This is a matter, if regarded from the standpoint of the moral duty imposed to make prepayment cash-boxes as strong as reasonableness will permit, that ought hardly to be considered. The whole cost of the stronger box, including lock, only amounts to about 3s. 6d. per meter in excess of the price of the old form of meter. The point is made as to the figure including lock, because special padlocks are, as a rule, an extra with the old type of money-box. Furthermore, the new box is practically indestructible, and will outspan in life several ordinary type boxes. Take the estimated life of a box constructed as this one is, and divide the cost by the number of years, and the cost per annum would be found to be infinitesimal. To the credit of the new box too has also to be set the reduced trouble, anxiety, and expense in repair caused by robberies. On the whole, the additional expense appears to be a small one to get, as opportunity serves, the extra security; and there is opportunity with every new fixture.

The police, as remarked, are particularly satisfied with the use of the new boxes. The introduction of the prepayment meter and its safe keeping have placed further responsibility upon them, and they have already found the application of the box in the selected quarters of Leicester a very great relief; and that relief causes them to wish for the hastening of the day when Leicester will know the old fragile money-box no more. The meter makers, too, have all taken up the patent box, and speak of it in high terms of approval—characterizing it as the best step that has been yet taken in curing the all too frequent robberies of prepaid gas moneys. Mr. Colson's staff are likewise equally confident of the security it affords. Imprisonment does not lessen the number of robberies under ordinary conditions. As a matter of fact, the advertisement the example of wrong-doing gets by prosecution instead of acting as a deterrent offers suggestion to others on the look-out for means of surreptitiously adding to their incomes. In the one or two attempts that have been made to plunder the patent boxes, the would-be thieves have, as already stated, met with no success. Where the habitual thieves know the patent box exists, they will not go. This shows the relative influence of a strong and a weak box; and as there is a gradual adoption of the money-boxes, as the old style gives place to the new more and more (which will be as circumstances require, or as meters are put into the makers' hands for repairs), it is hoped that the pilfering of meters will in time be altogether a thing of the past in Leicester. Of course, all new meters are having the patent box attached, as the Gas Committee and Mr. Colson are not minded to perpetuate—except so long as is reasonably necessary with the gas-meters now fixed—even the memory of a thing that has given so much trouble not only to the Gas Department, but to the police and to the magistrates; and in this the Corporation are freely supporting the Gas Department. Even the labour members are eloquent in urging the protection of the poor prepayment consumer by the slight additional expenditure per meter involved. We certainly think that Leicester's success has made out a splendid case for the adoption of a special and stronger cash-box for prepayment meters.

Masonic.—Bro. J. Winson Scott, well known in the gas profession from his connection with the firm of Messrs. R. & J. Dempster, Limited, of Manchester, was last Wednesday installed W.M. of the Lodge of Integrity, No. 163, in the Province of East Lancashire.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report.

THE following is the report of the Directors of this Company for the six months ending Dec. 31, which, with the accounts for this period (see p. 357), will be presented to the proprietors at the half-yearly meeting to be held on the 13th inst.

It is very commonly supposed that those who control gas companies are strangers to all business anxieties and difficulties. Years ago that might have been to some extent the case; but it is now very far from true. In the old days, prior to the first coal panic in 1872-3, the price of coal was uniform from year to year; the price of coke as a general rule varied little except in very cold weather; and in the tar and ammonia markets speculators did not cause great fluctuations in prices. Municipal trading had not begun, and municipal debts were, therefore, generally non-existent, and rates were at a moderate and practically constant figure. This is now all changed; and, especially since 1889, the desires and the efforts of the Directors to reduce the price of gas have been repeatedly thwarted. The reduction to 2s. per 1000 cubic feet made at Midsummer, 1904, has been difficult to maintain, owing to an unexpected fall in the price of coke, and later to a rise in that of coal and the great increase in rates. In the three December half years, there have been deficiencies, met by the balance brought forward; while in one only of the two June half years was there a small surplus. But, notwithstanding these difficulties, the 2s. price has been maintained.

In the half year under review, coal—although somewhat less has been used, owing to a greater yield of gas per ton (due to improved working) and to a reduction of nearly one-half per cent. in the quantity of gas sold—has cost £23,684 more than in the corresponding half of the previous year. Coke and breeze, however, have yielded £17,726 more; but, on the other hand, tar and ammonia have produced £5492 less—the net deficiency on these items being about £12,000. Rates are £4818 more—an increase of over 12 per cent. The Directors have consequently been compelled to undertake an expensive appeal to the Sessions against some recently increased assessments, for they will not submit to what they feel to be very unfair treatment by some of the Unions. These extra expenses, and a slight falling off in the receipts for gas, result in a deficiency on the half year of £15,313. The shareholders are entitled, at the present price of gas, to a dividend of £5 14s. 8d. per cent. They have received 5½ per cent. since June, 1904; and the Directors recommend that a dividend at that rate per annum be again paid.

The coal contracts made last April were at an advance of about 1s. per ton, which meant an addition of £60,000 to the year's coal bill. Since then, owing to an extra demand for this class of coal for iron making and for export, there has been a further considerable rise—not because demand exceeds supply, but because the coalowners at such times advance prices, often by agreement among themselves; and if buyers respond, there is no reason why the advance should not go on to any extent. There is no scarcity of coal, and never has been, in any of these panics. The gas companies are probably the best customers of the collieries that supply this class of coal; and instead of acting as isolated units, they should act unitedly, and refuse to pay unreasonable prices such as those just given by the Copenhagen Municipality, who have chosen the worst time of the year for making their contracts.

The slight decrease in consumption is certainly due to the increasing adoption of the incandescent mantle, for the Company's business is constantly increasing. Compared with the December half of 1905, there are 14,401 more consumers, mainly using slot meters; and 13,358 more cooking-stoves have been supplied. There has also been a considerable increase of gas-fires, gas-engines, and other industrial applications of gas for various purposes. Referring to the reduction of consumption caused by the increasing use of the mantle, it is not for this Company to complain, seeing that they took the lead five years ago, supported by thirty or forty gas companies and corporations supplying gas, in obtaining free trade in cheap mantles for Great Britain, as had been the case in Germany for several years.

These troubles and difficulties are only temporary, and will pass away or be overcome. On the other hand, the Company have two great sources of permanent satisfaction. The confidence and goodwill of consumers have been gained by many years of fair and considerate treatment. This policy of the Directors has been loyally and sympathetically carried out by the Company's officers and workmen, who come in contact with, and therefore represent, the Company to the consumers; and its success is largely due to their co-operation. The other ground of satisfaction is to be found in the happy relations that exist between the Company and all the employees, rendering capital and labour difficulties and anxieties, so common elsewhere, utterly unknown here. The employees as shareholders have an effective interest in the Company, which is increasingly manifested year by year.

The number of shareholders is 14,804. Of these, 8263 are consumers of gas, who can be of service to the Company in various directions, and 4119 are employees; and, as partners in the concern, it is their interest as well as their duty to promote efficiency, economy, and the general welfare of the Company.

SALES OF COKE.

[COMMUNICATED.]

SOME excuse must be made for introducing the subject of coke sales at a time when so much improvement is being shown in the coke market; but slack times will come, and it is for the future that preparations should be made.

Gas managers so frequently have the greatest of difficulties in disposing of their coke at satisfactory prices, that any means to increase its popularity as a domestic fuel is greatly to be desired. Few people—and these are chiefly confined to quite the poorer classes—are aware of the economic properties of coke for household purposes; and this is a matter for surprise when its advantages are considered. In cleanliness and cheapness, it altogether surpasses coal. Coke would be more generally used but for the fact that most people have the mistaken idea that a special stove is needed for the purpose. This was shown to be quite unnecessary by Sir Charles Cookson at a meeting of the Smoke Abatement Society. This gentleman strongly advocates the use of coke in the ordinary kitchen and sitting-room grates. Speaking from experience—as he burns nothing but coke in his own house—he claimed that great economy, coupled with many other advantages, could be effected by the use of this fuel. Yet another speaker, endorsing Sir C. Cookson's opinions, expressed the opinion that "coke has all the advantages, but none of the disadvantages, of coal. The ashes were clean and the grates were clean. There was a noticeable absence of smuts and black dust and dirt in the room, far less work for the servants, and none for the sweep."

But it is with coal and coke mixed that, speaking generally, the most satisfactory results are obtained; the fires can be made brighter, clearer, hotter, and cheaper than if coal alone is used. The reason for this is that the tar in the coal has the effect of binding it into a solid mass through which the air cannot percolate, with the result that the fire will die out unless frequently stirred; but where a mixture is used, the coke effectually counteracts the binding tendency of the coal, and gives to the fire the required ventilation. Several gas companies—and prominent among them may be mentioned the South Metropolitan and the Croydon—advertise the advantages of a mixture of coal and coke. It was to demonstrate these advantages that the writer recently made some tests in an ordinary kitchen grate; and the results obtained fully bear out the above statements.

Weight Mixed.	Weight Used.	State of Fire.	Order of Merit.	Cost per Day.	Cost per Annum.
	lbs.			d.	£ s. d.
I. Coal 30 lbs. .	23	Moderate.	3rd	2·87	4 7 3
II. Coal 15 lbs. . } Coke 15 lbs. . }	20	Good clear fire. Great heat.	1st	2·32	3 10 7
III. Coke 30 lbs. .	17	Moderate.	4th	1·82	2 15 4
IV. Coal 10 lbs. . } Coke 20 lbs. . }	18	Good clear fire.	2nd	2·03	3 1 8

The costs are calculated on the basis of coal at 1s. 2d. per cwt., and broken coke at 1s. per cwt.

On each day the fire was kept up for fourteen hours. A very large fire was maintained on the second day for four hours, for making bread. From the above table, it will be noticed that coal, when used alone, proved to be the most expensive; while it only ranked third in order of merit. Coal and coke equally mixed gave the most satisfactory results at a moderate cost; while one-third coal and two-thirds coke made a good fire at a low cost—a fire that would be good enough for almost any purpose. Coke alone is the most economical of all, and would be found satisfactory for use when a moderate fire only is required, or on occasions when a fire has to be kept alight for some hours without being used.

The writer makes a practice of using a mixture of coal and coke in all rooms, and can testify that great benefit is derived from so doing. The saving is considerable, as is shown in the accompanying table; while the fires are much hotter, and retain their heat for a long time without attention. The writer has lately made a practice of ordering an equal number of sacks of both coal and coke, and has given instructions for the sacks to be shot alternately into the cellar. This saves the necessity of mixing. Of course, it must be remembered that a sack of coke only weighs half as much as a sack of coal; so that if an equal number of sacks of each are ordered, the mixture will be one-third coke and two-thirds coal—a mixture which proves very satisfactory for use in sitting-room grates, although a larger proportion of coke would be more suitable and economical for kitchen grates, where a strong draught may be obtained. Most people would adopt the use of this mixture if the beneficial and economical effects were made apparent to them. Of course, many people are so conservative that it is almost an impossibility to persuade them to depart from their customary practices; yet in many towns the gas companies are gaining such a good reputation for zealous and careful attention to their customers' interests, that it should not be a difficult matter to introduce to their notice the advantages of using a proportion of coke with their coal. Having once obtained a connection, the method would quickly recommend itself.

The next question to consider is the best means to provide the

broken or small coke for disposal to customers. The method of which the writer has experience is a very good one, and has the advantages of being efficient and economical. The coke and breeze are taken from the retort-house in trucks and are tipped together on the heap. After the large coke has been loaded into vans or trucks from any part of the heap, the breeze and small coke are carted to a coke screen, where it is shot into a large sort of trough holding about a ton and forming the boot of an elevator. This shoots the breeze and coke into an overhead rotary screen, where it is separated into three distinct sizes—breeze, small coke, and large coke—and deposits each sort into a different hopper.

The screen, which is some 8 feet in length, is drilled with 1-inch holes for a distance of 4 ft. 6 in., and the remainder with 2-inch holes. The breeze, of which there is much the largest proportion, drops into the first hopper and the small coke into the second hopper—the large coke passing straight through. The proportion of small coke varies from one-fourth to one-fifth, and the larger coke from one-tenth to one-twentieth. The breeze is thence removed from the hopper by trucks to the boiler-house, or loaded direct into sacks by means of a funnel fixed on the hopper door. The coke can be loaded into vans, trucks, sacks, or barrows, whichever is most convenient. The work of feeding the elevator and loading trucks, vans, sacks, &c., can be done for about 4d. per ton, basing it on a daily quantity of about 40 tons; while the power required for driving an elevator and the rotary screen is very small. The extra price of 1d. per cwt. obtained for broken or small coke should alone pay the wages bill.

Many works are in the habit of breaking coke for sale. This seems quite unnecessary, as in most works, and especially where stoking machinery is in use, there is sufficient small coke already made to satisfy the demand; besides, in breaking coke, a certain proportion is unavoidably lost, being broken into dust and breeze. In small works where all the coke is drawn from the retorts by hand, it would no doubt be necessary for the coke to be broken to supply any considerable quantity. Some gas managers with a good local demand for coke may not see the necessity for pushing the sale of broken coke; but there are many, especially those in residential districts, who would find a good connection among private consumers a valuable asset in slack times.

GAS UNDERTAKINGS RETURNS.

The returns relating to the gas undertakings of the United Kingdom for the year ending Dec. 31, 1905, in the case of the Companies, and March 25, 1906, for the Local Authorities, were issued yesterday—just about three weeks earlier than was the case last year.

Particulars are furnished this year in reference to 752 undertakings, compared with 734 before. The new-comers among the Companies are Andover, Aylesbury, Brentwood, Corbridge, East Cowes, Epping, Haslemere, Hayling Island, Hessle, Hitchin, Sandiacre, Seaham, Staveley, Tavistock, and Ystalyfera. Chard drops out, and appears in the list of Local Authorities, the total number of which is 270, compared with 265 before. The new entries among the latter are Chard, Kirkby-in-Ashfield, Rickmansworth, Bangor, and Omagh. The capital authorized for the 752 undertakings (including other purposes than gas supply in certain cases) is £144,262,219, of which £124,194,221 has been paid up and borrowed. The total receipts are: Companies, £17,617,598; Local Authorities, £9,636,107—making the total receipts, £27,253,705.

The statistics relating to working show that 14,480,325 tons of coal were carbonized; the quantity of gas produced being 174,904,791,000 cubic feet, of which 161,407,725,000 cubic feet were sold. The total make is inclusive of 19,736,859,000 cubic feet of water gas and 101,250 cubic feet of acetylene gas. The totals in the preceding returns were: Coals, 14,295,602 tons; gas made, 168,647,676,000 cubic feet, of which 155,579,725,000 cubic feet were sold; the make being inclusive of 18,752,500,000 cubic feet of water gas and 103,500 cubic feet of acetylene gas. The extended use of water gas is shown by the following figures in the totals for the Companies in the past seven years. In 1899, the quantity supplied was 7,121,198,000 cubic feet; in 1900, 8,945,670,000 cubic feet; in 1901, 11,410,279,000 cubic feet; in 1902, 12,407,734,000 cubic feet; and in 1903, 13,056,741,000 cubic feet; while in 1904 the make was 13,718,857,000 cubic feet, and in 1905, 14,762,584,000 cubic feet (the sales in these two years not being given). The figures for the Local Authorities are: In 1899-1900, 2,955,828,000 cubic feet; in 1900-1, 3,162,782,000 cubic feet; in 1901-2, 3,955,621,000 cubic feet; in 1902-3, 4,459,916,000 cubic feet; in 1903-4, 4,850,007,000 cubic feet; in 1904-5, 5,033,643,000 cubic feet (make); and in 1905-6, 4,974,275,000 cubic feet (make).

At the date to which the last returns were made up, there were 30,931 miles of mains in use to supply 5,064,075 consumers and 665,791 public lamps. The preceding figures were: Miles of mains, 30,890; consumers, 4,737,177; public lamps, 654,183.

With regard to carburetted water gas, the returns show that when they were made up it was being supplied by the following Local Authorities and Companies; the maximum proportions of its admixture with coal gas (except where averages are stated) being given in parentheses.

Local Authorities.

Accrington (20).	Edinburgh (18·5).	Oldbury (20).
Barrow-in-Furness (15·9).	Halifax (11).	Oldham (‖).
Belfast (50).	Hebden Bridge (20 to 25).	Paisley (¶).
Birkenhead (33·3).	Leeds (25†).	Smethwick (20).
Birmingham (25).	Leigh (2·78).	Southport (51·37).
Blackburn (25).	Lincoln (33·33‡).	Stafford (19·7).
Burnley (35).	Longton (36).	Stockport (23·21).
Carlisle (28·74).	Loughborough (25).	Stockton-on-Tees (30·1).
Chorley (31).	Manchester (§).	Tipton (3·91).
Coventry (36·43*).	Middlesbrough (no limit).	Todmorden (17).
Dundee (25).	Nottingham (6·14).	West Bromwich (19·32).

* For one day only. † At one station only. ‡ In daytime; none at night. § 22·46 per cent. on total output. ‖ 36 per cent. at one station only on one day only. ¶ Oil gas 1·85 per cent.

Companies.

Alliance and Dublin (51).	Guildford (25 to 33⅓).	Ramsbottom (25).
Aylesbury (20).	Hampton Court (29).	Reading (34).
Barking (17·5).	Harrow (48).	Redhill (32).
Bath (50).	Hartlepool (†).	Rochester (34·7).
Bexhill (37·04).	Hastings (44·17‡).	Romford (23·4).
Bournemouth (30).	Hornsey (42).	Rushden and Higham Ferrers (21·25, av. 14·1)
Bilston (about 10).	Horsham (40).	Scarborough (25·80).
Bognor (not stated).	Hull—British (35).	Southampton (34).
Brentford (39).	Ilford (20·8).	Southend (50·07).
Bridgwater (33⅓, av. 22⅓).	Kingston-on-Thames (23).	Southgate & District (52).
Bridlington (33).	Liverpool (50).	Staines and Egham (25).
Brighton (39·58).	Lea Bridge (50).	Stretford (29·91).
Cleethorpes (15).	Londonderry (17).	Swansea (22).
Colchester (23·38).	Maidenhead (36·3).	Swindon United (32·5).
Commercial (41, av. 29).	Malton (about 25).	Taunton (35).
Croydon (42, av. 34).	Marlborough (36).	Tonbridge (25).
Dartford (17·9).	Merthyr Tydfil (30).	Tottenham (52).
Dorking (50).	Mitcham (44).	Tunbridge Wells (25 to 30)
Durham (20).	Newcastle (15·05 one wk.).	Wandsworth (33).
Eastbourne (40).	Newport, Mon. (39).	Watford (32·04).
Epsom (36).	North Middlesex (67·55).	West Ham (38).
Falmouth (30).	Norwich—British (47·8).	Weston-super-Mare (25).
Faversham (11·50).	Plymouth (43·67).	Wexford (20).
Folkestone (40).	Portsea Island (35·5).	Winchester (30).
Gaslight and Coke (*).	Prescot (21·5).	York (23·04).
Gosport (45).	Preston (48·4 av. for one week).	
Gravesend (45).		

* Of the total quantity of gas sent out by the Company, 11 per cent. was unmixed with water gas. As regards the remainder, 62 per cent. contained a maximum proportion of 27 per cent. of carburetted water gas; 8 per cent., a maximum proportion of 33 per cent; 12 per cent., a maximum proportion of 36 per cent.; 10 per cent, a maximum proportion of 39 per cent.; and 8 per cent., a maximum proportion of 40 per cent. † About 25 per cent.; average about 16 per cent. ‡ Average for the year, 32·28 per cent.

Six new Companies—Aylesbury, Bognor, Bridgwater, Reading Prescot, and Weston-super-Mare—appear in the above list. The only new Local Authority furnishing a return is that of Leigh (Lancs.); and Leicester drops out.

As in previous returns, particulars are furnished regarding the nature and quantity of materials other than coal used for the manufacture of gas, the supply of water gas, and the maximum proportion of its admixture with coal gas. The extent to which oil, petroleum spirit, carburine, or "other material" is being utilized for the production of gas will be seen from the following list of Companies and Local Authorities who make returns:—

Companies.

Alliance and Dublin.	Gosport.	Plymouth.
Alton.	Grantham.	Portsea Island.
Aylesbury.	Gravesend.	Prescot.
Barking.	Great Marlow.	Preston.
Bath.	Guildford.	Reading.
Bexhill.	Halesowen.	Redhill.
Bognor.	Hampton Court.	Richmond.
Bournemouth.	Harrow and Stanmore.	Rochester.
Brentford.	Hartlepool.	Romford.
Brentwood.	Hastings.	Rushden and Higham Ferrers.
Bridgwater.	Hornsey.	Scarborough.
Bridlington.	Horsham.	Shrewsbury.
Brighton and Hove.	Hull (British Co.).	Southampton.
Bristol.	Huyton and Roby.	Southend.
Canterbury.	Ilford.	Southgate and District.
Cleethorpes.	Isle of Thanet.	SouthSuburban(C.P.Co.).
Coatbridge.	Kingston-on-Thames.	Staines and Egham.
Colchester.	Lea Bridge.	Stretford.
Commercial.	Littleborough.	Sutton and Hooton.
Croydon.	Liverpool.	Swansea.
Dartford.	Londonderry.	Swindon.
Derby.	Maidenhead.	Taunton.
Dorking.	Malton.	Tonbridge.
Dover.	Marlborough.	Tottenham.
Durham.	Merthyr Tydfil.	Tunbridge Wells.
Eastbourne.	Mid Kent.	Tynemouth.
Epsom and Ewell.	Mitcham and Wimbledon.	Wandsworth and Putney.
Exeter.	Musselburgh.	Watford.
Falmouth.	Newcastle-upon-Tyne.	West Ham.
Faversham.	Newport (Mon.).	Weston-super-Mare.
Folkestone.	Northfleet.	Wexford.
Gaslight and Coke.	North Middlesex.	Winchester.
Godalming.	Norwich (British Co.).	York.

Local Authorities.

Accrington.	Belfast.	Chorley.
Airdrie.	Birkenhead.	Coventry.
Alloa.	Birmingham.	Darlington.
Alva.	Blackburn.	Darwen.
Arbroath.	Blackpool.	Dundee.
Ashburton.	Burnley.	Dunfermline.
Ashford.	Bury.	Edinburgh.
Barrow-in-Furness.	Carlisle.	Glastonbury.

Greenock.
Halifax.
Hebden Bridge.
Helensburgh.
Hereford.
Heywood.
Ilkeston.
Kilsyth.
Leeds.
Leek.
Leigh.
Lincoln.
Longton.
Loughborough.
Manchester.
Middlesbrough.
Middleton.
Mossley.
Nottingham.
Oldbury.
Oldham.
Paisley.
Perth.
Portsoy (acet. gas).
Rochdale.
St. Helens.
Smethwick.
Southport.
Stafford.
Stalybridge.
Stratford-on-Avon.
Stockport.
Stockton-on-Tees.
Tipton.
Todmorden.
Torquay (St. Mary Ch.).
Walsall.
Warrington.
West Bromwich.
Wigan.

The new names in the above lists are the Aylesbury, Brentwood, Bridgwater, Reading, Sutton and Hooton, and Weston-super-Mare Companies. On the other hand, the Aldershot, South Shields, Waltham Abbey, and Wilmslow Companies are absent. Among the Local Authorities, the new-comers are Ashford, Glastonbury, Nottingham, Stalybridge, and Wigan; while Dumfries, Glasgow, Keighley, and Leicester drop out. The Gas Commissioners of Portsoy used 11¼ tons of carbide of calcium in the manufacture of an estimated quantity of 101,250 cubic feet of acetylene gas, of which 67,485 cubic feet were employed for private and 23,664 cubic feet for public lighting—together 91,149 cubic feet, at the price of 6s. per 100 cubic feet.

Comparing the figures furnished by the present returns with those contained in similar returns for the previous nine years, it will be seen that the Companies show as follows:—

Year.	Share and Premium Capital Paid up.	Loan Capital Issued.	Capital Sold under Auction Clauses.	Premiums Realized.
1896. . .	£41,433,325	£8,185,710	£6,783,468	£3,512,818
1897. . .	42,368,976	8,891,218	7,248,545	3,405,345
1898. . .	44,134,488	9,360,293	7,786,216	3,995,781
1899. . .	57,937,016	11,451,134	10,031,384	4,301,820
1900. . .	59,638,877	11,775,642	11,030,474	4,867,124
1901. . .	62,775,845	12,201,533	11,815,348	4,701,958
1902. . .	64,299,112	12,829,925	12,902,864	5,238,898
1903. . .	67,417,798	13,451,381	13,829,567	5,129,028
1904. . .	68,953,306	13,775,734	14,645,691	5,563,994
1905. . .	70,605,726	14,176,599	15,644,995	5,412,406

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1896. . .	7,681,770	80,015,323,004	1,439,272	308,180
1897. . .	7,963,465	84,040,175,901	1,549,627	314,451
1898. . .	7,958,669	86,705,722,752	1,670,847	319,007
1899. . .	8,321,187	91,794,898,282	1,817,649	324,166
1900. . .	8,426,853	94,869,749,232	1,945,825	326,813
1901. . .	8,580,365	97,386,618,553	2,048,359	326,209
1902. . .	8,520,004	99,676,048,000	2,197,987	333,308
1903. . .	8,528,823	101,490,084,000	2,385,348	335,363
1904. . .	8,673,343	105,311,980,000	2,588,917	343,908
1905. . .	8,722,145	109,823,682,000*	2,813,156	350,113

* Including 14,762,584,000 cubic feet of water gas. Number of cubic feet sold, 100,848,445,000.

The somewhat similar figures for the Local Authorities are—

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the next Column).	Interest, &c., Paid.*	Net Profit after Payment of Items in preceding Column.
1896-97 .	£26,561,689	£6,639,342	£4,989,283	£1,136,789	£534,390
1897-98 .	27,376,324	6,759,883	5,058,705	1,161,171	554,014
1898-99 .	28,614,971	7,177,670	5,365,995	1,219,771	625,780
1899-00 .	29,658,730	8,048,089	6,155,725	1,280,168	663,189
1900-01 .	31,509,701	9,121,418	7,463,693	1,353,259	409,802
1901-02 .	34,045,442	9,300,567	7,630,856	1,467,232	414,091
1902-03 .	35,738,023	9,554,984	7,215,502	1,584,985	793,764
1903-04 .	37,103,279	9,819,685	7,182,008	1,700,405	967,194
1904-05 .	38,512,295	9,546,682	7,052,474	1,738,682	790,450
1905-06 .	39,401,896	9,636,107	7,085,710	1,799,094	798,210

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; 3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Number of Consumers.	Public Lamps Lighted.
1896-97. .	4,614,969	47,026,280,408	1,406,456	232,464
1897-98. .	4,652,688	48,652,558,526	1,475,749	239,352
1898-99. .	4,883,148	51,441,272,030	1,578,291	247,857
1899-00. .	5,289,501	55,360,659,139	1,667,908	257,040
1900-01. .	5,479,435	57,138,062,255	1,767,464	278,343
1901-02. .	5,522,264	59,300,273,086	1,872,633	287,887
1902-03. .	5,589,215	60,902,739,000	1,970,738	294,828
1903-04. .	5,673,013	62,717,759,000	1,945,777	301,308
1904-05. .	5,622,259	63,335,696,000	2,148,260	310,275
1905- .	5,758,180	65,081,109,000*	2,250,919	315,678

* Including 4,974,275,000 cubic feet of water gas and 101,250 cubic feet of acetylene gas. Number of cubic feet consumed, 60,559,280,000.

PERSONAL.

A meeting of the officials of the Birmingham Corporation Gas Department was held at the Queen's Hotel on the 28th ult., to take leave of Mr. W. H. Barnes, who has been Superintendent of the branch office at Wednesbury for the past thirty years, and who has now retired after a total service of forty-seven years with the Corporation and their predecessors, the Birmingham and Staffordshire Gas Company. Mr. G. Hampton Barber, the Secretary of the Department, who presided, referred to the long and honourable service which Mr. Barnes had rendered to the gas undertaking, and spoke of the high esteem in which he was held by the Gas Committee and by his colleagues on the staff. On behalf of the subscribers, he presented Mr. Barnes with a Zeiss prism binocular field-glass and a pocket aneroid in silver. Mr. Henry Hack, the Chief Engineer of the Department, and some of the senior officials present, having addressed the meeting, Mr. Barnes made a suitable reply, which included some interesting reminiscences of his long connection with the gas undertaking. He left England for Egypt last Friday. Mr. Barnes is succeeded by Mr. F. W. Deane, who has been in the service of the Corporation for nearly twenty-seven years.

Mr. W. Wilson, the Manager of the Kirkintilloch Corporation Gas-Works, was last Tuesday appointed Engineer and Manager of the Falkirk Corporation Gas-Works, in succession to the late Mr. W. M'Crae, who resigned in December, and who died on the 22nd ult. Mr. Wilson, who is a young man—being only 31 years of age—is the son of Mr. Thomas Wilson, the Manager of the Coatbridge Gas Company. He was trained as a chemist in the office of Mr. R. R. Tatlock, Public Analyst and Gas Examiner, of Glasgow, and served a period as draughtsman with the Barrowfield Iron-Works, Limited. He was afterwards Assistant to his father at Coatbridge; and while in this position he designed and superintended the erection in the gas-works of plant of the value of £35,000. For about eighteen months he was Assistant-Manager in the Perth Gas-Works. Then for two years he was an assistant in the meter-works of Messrs. James Milne and Son, Limited, of Edinburgh. Five years ago he was appointed to the post in Kirkintilloch. Since he went there the price of gas has been reduced from 3s. 2d. to 2s. 2d. per 1000 cubic feet to ordinary consumers, and to 2s. for power purposes and public lighting. At the present time he is Vice-President of the Western District Section of the Scottish Junior Gas Association.

OBITUARY.

To the great regret of a wide circle of friends and acquaintances, the death took place in the early hours of last Thursday morning, at his residence, "Waverley," at Grappenhall, of Mr. William Russell Neil, a Director of Messrs. Fletcher, Russell, and Co., Limited. Mr. Neil had been only a short time unwell, and the news of his unexpected death, the immediate cause of which was the rupture of a blood-vessel, came as a shock to all the employees at the Warrington and Pendleton works. Mr. Neil was the second son of Mr. Alexander Neil, the Chairman of the Company. From his boyhood he had been actively connected with the works at Pendleton, and had been a Director of the Company about ten years. Of a kindly and genial disposition, he was highly popular among all the employees, especially those at the Palatine Works, in whose welfare he took great interest. He was well known and highly respected throughout the gas engineering trade. He was a Freemason, being a member of the "Lodge of Friendship," No. 2963, and of the "Mark" Lodge, Warrington. He was 37 years of age, and is survived by a widow and four children. The funeral took place yesterday at Grappenhall Church; and, as a mark of respect, the Palatine Works were closed for the day.

We regret to record the sudden death, last Wednesday, in his 77th year, of Mr. Isaac Adolphus Crookenden, who was personally known to a number of our readers from his connection with the gas and water supply of the Metropolis. Mr. Crookenden became closely associated with the former nearly forty years ago, when he was appointed Secretary of the Phœnix Gas Company, in succession to Mr. Charles Pridden, who relinquished the position in October, 1867, after thirty-seven years' service, on account of impaired health. Mr. Crookenden held the post till 1880, when the Company was amalgamated with the South Metropolitan Gas Company. In 1883, the Secretaryship of the East London Water Company became vacant by the death of Mr. James Bourne, and Mr. Crookenden obtained the appointment. Up till that time the meetings of the Company had been held with closed doors; but with the October meeting in 1883—the first the new Secretary attended—a departure was made, and representatives of the Press were admitted. The Company passed through some troublous times before their undertaking was transferred to the Metropolitan Water Board under the Act of 1902. But in their Secretary they had a thoroughly capable official, who was always ready to do battle for them in the face of public opprobrium; and his faithful services were duly recognized when the time came that they were no longer required. Mr. Crookenden was interested in several gas and water undertakings, and was a Director of the Barnet District Gas and Water Company.

THE CHEMISTRY OF GAS MANUFACTURE.

The fourth edition of Mr. W. J. Atkinson Butterfield's handbook (Vol. 1) on the "Chemistry of Gas Manufacture"* has just been issued. This work was originally published as one volume; but, as the author in his preface remarks, the advances in the gas industry, rendering extensive revision and enlargement necessary, precluded its continuance as a single volume, and in 1904 the first half of the work—that dealing with the materials and processes of gas manufacture—was revised and issued as a separate volume. This part has again been subjected to revision, and is (with several pages of fresh matter) now published as the fourth edition. A second volume, covering "Testing and the Use of Gas," is stated to be in course of preparation. With the frequent and continued development of the various branches of the gas industry—which, in spite of all competition, is refreshingly progressive—text-books in many parts must obviously become out of date; and the need for revision is easily understood. It is much to Mr. Butterfield's credit that the call for his treatise is such as to require a new edition in practically less than three years; and it is not less to the credit of the industry that there are so many students and readers alike whose enthusiasm has apparently exhausted previous issues. The work, which is described as a "practical handbook," is divided into some seven chapters, and deals with the raw materials used, the processes and plant involved in the manufacture of coal gas, carburetted water gas, and oil gas, and enrichment by light oils.

In discussing raw materials, Mr. Butterfield gives an interesting and sufficiently full account of the changes which occur in coal formation, from cellular fibre to anthracite, with particulars as to their physical and chemical character. He also deals with methods of sampling, whether from barge, waggon, or store, and devotes some pages to the laboratory determination of the elementary composition of coal. A description is given of the usual method of practically testing gas coal by a small cast-iron retort taking a 2·24 lb. charge, with a condenser, two purifiers, and holder; the washer being stated as usually omitted. A book such as this should be educative rather than merely descriptive; and one wonders why the author does not suggest the incompleteness of the plant as "generally fixed." There is no reason why the experimental plant should not more closely accord with ordinary working; the ascension-pipe being provided, if necessary, with a hydraulic main, and a washer and scrubber being added to the purifying plant. If these conditions necessitated a slight vacuum, this could be managed by duly counterbalancing the test holder. Mr. Butterfield states that with the gas plant he describes both yield and quality are higher than is the case with ordinary working. This is well known; but the absence of back-pressure, scrubbing action, and other disadvantages from which coal gas usually suffers, might account for it.

Anthracite and coke are classed together as being suitable materials for the production of water gas. While, in point of fact, this is correct, it might be well, since the volume is concerned with town gas, to remind the reader that anthracite is not generally employed in gas-works for the purpose suggested. The chapter includes an interesting and useful description of the various petroleums employed in the manufacture of carburetted water gas, and also of the methods of their analysis. Tabulated results of gas-making trials of various oils are furnished; and these will be very handy for reference. At the end of the description of carburine and other light oils, the author curiously enough says that a "material which is serviceable for enriching gas at temperatures above that of the atmosphere, is naphthalene." The possibilities of naphthalene in this direction will not be disputed; but after all the trouble it has given, and is still giving, to gas manufacturers, it is strange to read of it as being "serviceable." Nevertheless, a useful table of naphthalene vapour tension is added. This chapter on raw materials (running into 65 pages) is well worth reading and studying. One would, however, suggest, to the author that in the next edition some reference to the storage of both coal and oil, the chemical changes and loss due to weathering, spontaneous combustion, and the like, should be made.

In the second chapter, Mr. Butterfield briefly describes retort-setting, methods of carbonization, and the necessary plant, including various forms of mechanical stokers. The purpose and value of this chapter are, however, to be found in the description of the chemical and physical reactions which take place in heating retorts and in the process of gas making itself. The author deals admirably with the phenomena of combustion in both the direct combustion furnace and the ordinary producer. The discussion of the problems of direct and gaseous firing would, however, be greatly helped if diagrammatically illustrated. At times, too, the meaning would be clearer if the sentences were shorter and less involved. In one case a sentence, taken at haphazard, runs into nine lines, and as a consequence loses in lucidity. The author deals with the consideration of the essential conditions governing the production of gas, and determining the nature and properties of its several constituents. What he says will well repay close and careful reading, and give the student a very good idea of the problems and difficulties of successful carbonization.

In passing, it may be noted that Mr. Butterfield seems to agree that the passage of water gas through the retort considerably increases the yield from the coal without any great loss of candle power. Under the heading of nitrogen distribution, it is pointed out that hydrogen passed over the coal under carbonization may cause no less than 35 per cent., instead of 14 per cent., of the nitrogen to be evolved as ammonia. Carbonic oxide also improves the yield. It would be interestiug, therefore, if the author could have stated how far the use of blue water gas containing both hydrogen and carbonic oxide had resulted in this way.

Mr. Butterfield gives careful consideration to the question of vertical-retort gas making, and incidentally suggests, in view of anticipations of large yields of gas by this method, that not more than 13,000 cubic feet of lighting gas as an extreme can be made from ordinary Durham coal and its tar. Anything beyond this approximate quantity must, he says, be obtained by infiltration of carbonic acid and atmospheric nitrogen, and this should be remembered when extravagant claims are made.

In the description of gas-works plant, the author cannot be considered happy; and the student should not depend too much on either letterpress or illustration for his information of the style of apparatus in general use. In dealing, for instance, with the cross section of D retorts, prominence is only given to the 20 in. by 13 in. section, that of 22 in. by 16 in. being referred to as a kind of afterthought. Ascension-pipes are described as being usually 5 inches in diameter. The illustrations of settings and furnaces, and particularly of bridge-pipes and hydraulic and foul mains, are crude, and far from typical. The author unnecessarily enters with full detail into the method of handling a three-man scoop, or of opening a mouthpiece-lid, and almost forgets more important matters—such as the relation of fuel consumption to the coke produced, the use of hot coke in the furnace, clinkering, the removal of coke, and the like. The descriptions of plant generally should certainly be revised, if not re-written; and it would be well to rearrange the paragraphs dealing with exhausting and condensation, inserting them after rather than before (as at present) those dealing with inclined and vertical retorts and also power stoking machinery. At the same time, some fuller discussion of the question of vacuum and the use of retort-house equilibrium governors would be useful. It is right to point out these defects; for it is a pity that so admirable a treatise in other respects should be thus marred.

The third chapter covers the various branches of gas purification; and in this section the reader will find nearly all that he requires for the study of the chemistry of washing, scrubbing, and the processes required for the elimination of the carbonic acid, sulphuretted hydrogen, carbon bisulphide, and other impurities. The author had previously given a table of the constituents of coal gas after condensation, and their percentage proportion; and he now adds a similar table showing those which it is necessary to remove from the crude gas. His general description of the chemistry of purification is exceedingly interesting, and affords much food for thought. There are times when one is disposed to disagree with him; but this is inevitably due to the many points in the fields of gas manufacture and purification which have still to be settled.

It is to be remarked that, in discussing tar-extractors, the author describes the "P. and A.," with but slight allusion to English forms. Tar fog is not mentioned; and very little is said about the effect of temperature on the washing and scrubbing processes. Beyond a bare sentence that an oil-charged washer sometimes follows the "P. and A." condenser, Mr. Butterfield makes no reference to the various and important steps taken of late for the removal of naphthalene. This is unfortunate; for the issue of his book offered a good opportunity for the discussion of the subject, and there is sufficient matter if only in the presentment of recently enunciated views. In other respects, the chapter has been brought up to date, as in the case of the description and illustration of the Jäger grids. Again, in dealing with the removal of H_2S, the chemical formulæ showing the general reaction with ferric hydrate are given; but no similar formulæ are furnished when discussing the elimination simply of CO_2 and H_2S by means of lime. Undue notice is perhaps given to the employment of Weldon mud; and one is led to infer that it is in fairly general use. The chapter contains useful information as to the methods of determining the purification value of lime and oxide.

A book on illuminating gas, to be comprehensive, must treat to some considerable extent of carburetted water gas, since its manufacture is carried on in many towns. The author states that two-thirds of all the gas made in North America is of this variety; and recently a claim has been made by a prominent firm that one-third of the town gas consumed by English-speaking peoples is now carburetted water gas. Chapter IV. is devoted to the subject, and contains valuable information as to both the intermittent and continuous systems of the manufacture of water gas. Thoughtful attention is paid to the theoretical considerations—both physical and chemical—involved in the process. The description and diagramatic illustration of a carburetted-gas plant are good; and the method of manufacture is clearly indicated. It may be said, indeed, that the chapter on carburetted water gas is—in matter and style—one of the best in the book. The author gives sufficiently full details of working as well as of the resultant gas, including a typical analysis of the latter. Useful figures are adduced, showing the groundless character of agitation against carburetted water gas on the part of those ignorant of its constituents. A few particulars are given in the chapter

* "The Chemistry of Gas Manufacture. Vol. I., Materials and Processes." By W. J. Atkinson Butterfield, M.A., &c. London: Charles Griffin and Co., Limited; 1907.

of the Dellwik-Fleischer and other methods of making simple water gas, and also of the use of this gas for self-enrichment processes. The author had already, in Chapter II., furnished some results of the blending of water gas with coal gas in retorts.

Chapter V. discusses various methods of making neat oil gas —such as the Pintsch, Tatham, and Peebles—mainly in view of its subsequent use as an enricher of poor gas. This is followed by a short chapter on carburation by means of carburine, benzol, and other spirits. Mr. Butterfield states that with gas of from 15 to 17 candles, a gallon of carburine raises about 8000 cubic feet 1 candle in illuminating power; and he regards this as being permanent. It can scarcely be said that gas of this quality requires enrichment; and it would have been more interesting and serviceable if Mr. Butterfield had been able to give figures proving or otherwise the permanence of the enrichment with gas of lower grades.

The last chapter is a mistake. It is obviously impossible in the compass of 9½ pages to treat of such varied subjects as carbonization of tar, station-meters, pressure-governors, gasholders and tanks, and several other diverse matters. The subject of tar carbonization merits some discussion, even if the process is accompanied by many difficulties; and this should properly come in Chapter II. Mr. Butterfield's work on the chemistry of gas manufacture is done, and on the whole well done, when he reaches the station-meter; and the constructural details of gasholders and tanks might well have been omitted. It would have been sufficient to have discussed here the physical conditions to which gas is subject while in the holder, and such matters as the possibilities and reasons of, say, naphthalene depositions at the holder inlet and outlet pipes.

In spite of the criticisms in this review, the book is a worthy contribution to technical literature on gas manufacture. Not only students, but all those in charge of, or interested in, gas-making operations should possess and study the work; and they will have read badly if they do not gain in their general knowledge or give fresh consideration to many of the problems of gas economics. We look forward with considerable interest to the issue of Mr. Butterfield's second volume.

THE GAS SECTION AT THE NEW GERMAN MUSEUM AT MUNICH.

An account has recently been given in the "Journal für Gasbeleuchtung" by Dr. E. Schilling, of Munich, of the exhibition of articles connected with the gas industry which has been prepared by him on behalf of the German Association of Gas and Water Engineers for the new museum at Munich. The permanent building for the reception of the museum is not yet completed; its foundation-stone having been only laid by the German Emperor a few months ago. The articles are, therefore, temporarily housed in an old cavalry barracks in the city.

The gas exhibit consists of ten sections, covering every branch of the industry, from raw materials to bye-products and appliances for the combustion of gas. In the first section, specimens of the commonest gas coals and of the coke obtained from them are shown, with diagrams and samples representing the yields of the various products obtained during carbonization, &c., as well as comparative samples of the coke made in a horizontal retort, a vertical retort, and a coke-oven respectively. The section also includes the Bunsen-Schilling apparatus for determining specific gravity, the Elster and the Lux gas-balances, Erdmann's gas-tester, two different "Verificateurs" by Giroud, a Junkers calorimeter, a complete Bunsen apparatus for gas analysis, &c.

Another room is devoted to the evolution of the modern retort furnace. Starting with the small iron retort used by Degner in 1818 to supply gas to a street-lamp in Schweinfurt, and an old cast-iron retort used by the Imperial Continental Gas Association in 1826, models or diagrams are exhibited of every form of iron or fire-clay carbonizing vessel employed up to the most recent date. The progress of regeneration is exemplified by a drawing of the first furnace built by Oechelhaeuser in 1876, and a model of the Munich furnace which can be taken to pieces. The same section includes a cameo of Dr. N. H. Schilling presented by the Association, and a copy of the first volumes of the "Handbook" and "Journal" published by him. Models of an inclined fire-clay retort-setting, of a Merz coke-conveyor, and of the new Nuremberg retort-house are exhibited, together with drawings and photographs of the Pintsch carburetted water gas plant in use in Charlottenburg and the Dessau vertical retort furnace. Elsewhere are found a drawing of the first gas-works built by Clegg in London in 1812, plans of the resin-gas works constructed by Schiele for Frankfort in 1828, and a drawing of the Imperial Continental Gas Association Cologne works in 1840. Among the apparatus is an original two-blade exhauster from Munich, a Dessau speed-regulator, and a Pelouze tar-separator. Numerous washers, scrubbers, station governors, and model gasholders are shown; the centre of the apartment being occupied by a complete model, no less than 13 feet long, of the new gas-works at Mosach, near Munich.

Another section comprises old and new gas-mains constructed of clay and cast iron. Syphon boxes, valves, and pipe joints are shown in great variety; this branch of the subject being illustrated by a vertical section of a street showing all the objects lying underground, and a plan of the long-distance gas transmission at St. Margrethen. Yet another section covers wet and dry gas-meters. Types of each meter with glass cases, and also sections in different directions of the modern prepayment meter, can be seen. Among the old apparatus is a dry meter made by William Richards, of London, in 1862, a wet meter made by Elster in 1858, and a wet meter made by Smith, of Hamburg, in 1862. The final section of the manufacturing branch includes a model public acetylene supply, an Amberg air-gas apparatus, and several drawings and diagrams of "aerogen" air-gas works.

In the department of combustion, considerable emphasis is thrown upon early methods of lighting, by the presence of pine torches, candles, and oil-lamps. Various hanging oil and paraffin lamps used in Paris, Nuremberg, and elsewhere are shown in the form of specimens or diagrams. A reproduction of the decree of the French Parliament, dated June 17, 1524, is shown, whereby the citizens of Paris were ordered to illuminate the streets by placing candles in their windows; while there is also an order issued by the authorities of Nuremburg in 1699, stating that nobody must be out at night without a lighted candle in his lantern. An original gas-burner as used in the street-lamps of London in 1814 is exhibited, followed by the various slit, regenerative, and intensifying burners which preceded incandescent mantles. Modern methods of lighting are shown by numerous specimens of upturned, inverted, and intensified incandescent gas burners, burners consuming compressed gas, an acetylene lamp, and an incandescent petroleum burner. As all the burners and lamps can be lighted, an admirable picture is afforded of the progress of the gas industry. On the walls are tables showing the various capacities and duties of the burners below, of which the accompanying table is a translation into British figures :—

—	Cubic Feet per Hour.	Candle Power.	Candles per Cub. Ft.
Iron jet burner	1·77	2·27	1·28
Iron two-hole burner	5·30	6·82	1·29
Steatite slit burner	5·66	14·55	2·57
,, fishtail	5·66	16·35	2·86
Bray burner	12·72	32·8	2·57
Argand	8·83	29·1	3·3
Incandescent with mantle of pure thoria	3·89	5·0	—
,, ,, ,, ,, ceria	3·18	1·82	—
Welsbach	4·24	72·7	17·2
Inverted incandescent	3·18	81·8	25·7
High-pressure burner	9·54	273	28·6
,, ,,	22·3	636	28·6
Air gas	21·2	273	12·9
Ordinary acetylene burner	0·85	36·4	42·8
Incandescent ,, ,,	0·53	54.6	103

In the department of incandescent gas, two of Welsbach's first experimental burners are shown, accompanied by samples of cotton, ramie, and all the apparatus and articles used in the manufacture of mantles. Igniting devices of various kinds are also on view. In the heating section, boilers, cookers, hot-plates, and room-warming stoves are shown, and also a model of the most modern hot-water radiator with gas firing.

The shortness of the time at Herr Schilling's disposal has prevented the exhibition of articles connected with the gas industry from being as comprehensive as could be wished; but it is to be hoped that the various lacunæ remaining will be soon filled.

Water Gas Interdicted for Paris.

The Paris Municipal Council have lately been occupied in settling the conditions of the new gas concession; and during the past few days the subject of water gas has been very much to the front. The member who has charge of the matter (M. Desplas), and also the Prefect of the Seine, wished to have it left with the Administration to authorize the future concessionary to make water gas, under certain conditions, and mix it with coal gas in the proportion of 15 per cent. The question was debated with some warmth on both sides. On the one hand, it was pointed out that water gas is in use without serious results in many foreign cities; and it was urged that Paris should not be afraid to follow these examples. But the opponents supported their arguments by citing numerous scientific experts—such as MM. Gréhant, Moissan, Armand Gauthier, and others—who have demonstrated the toxic property of carbon monoxide; and they were backed up by the "Matin," who on Friday, when the discussion was brought to a close, came out with a rather sensational article in which it was stated that Professor d'Arsonval and physiologists, hygienists, and doctors without exception had condemned water gas. So much science arrayed against practical experience probably frightened some of the waverers, and led them to oppose the perfectly reasonable proposition of the Prefect of the Seine. At all events, when the Council were asked to vote upon a motion by MM. Navarre and Fribourg, to interdict altogether the making of water gas, it was carried by 37 votes to 35. Whether by doing this they have, as the "Matin" thinks, acted with wisdom, remains to be seen; because the permission to manufacture water gas was one of the most important factors in forming an estimate of the profits to accrue to the Municipality under the new concession

PROVISIONAL ORDERS FOR 1907.

In the three preceding issues of the "Journal," the principal features of the Water Bills for next session were dealt with. We now notice the Provisional Orders.

The Dorking Water Order is to empower the Dorking Water Company to raise additional capital to an amount not exceeding £15,000 by the issue of new ordinary or preference shares or stock, and to borrow on mortgage any sum or sums not exceeding one-fourth of the new capital actually issued, including premiums. The additional capital is to be offered by auction or tender, and is to carry 7 or 5 per cent. dividend according as it is issued as ordinary or preference.

The Herts and Essex Water Order is to authorize the Herts and Essex Water Company, Limited, to enlarge their area of supply and raise additional capital. If the Order is granted, the parishes of Roydon, Great and Little Parndon, and Nazeing, all in the county of Essex, will be brought within the Company's limits. The Order contains a number of provisions for the protection of the Hertfordshire County Council, the first of which makes it unlawful for the Company to supply, in bulk or otherwise, water derived from any source in the county or in the watershed of the River Lea, beyond or for use beyond the limits. The amount of additional capital applied for is £75,000, with borrowing powers to the extent of one-third. It is to be put up to auction or tender, and any not disposed of is to be offered to the shareholders. Ordinary capital is to carry 7 per cent. and preference capital 6 per cent. dividend. The Company wish to be authorised to sell, but not manufacture, pipes, valves, meters, and appliances used in connection with the supply of water.

The Mid-Kent Water Order is to empower the Mid-Kent Water Company to extend their limits of supply so as to include a number of parishes in the county of Kent. One of these is Sutton Valence; but the Company undertake not to supply water in the parish until after they have acquired the undertaking of the Hollingbourne Rural District Council, or have obtained the consent of the Council given under their common seal. Another parish to come within the new limits is Woodchurch; and it is proposed to repeal so much of the Cranbrook District Water Act, 1898, as authorizes the Cranbrook Water Company to supply the first-named place. The applicants ask for authority to raise additional capital not exceeding £20,000, borrow to the extent of one-fourth, and create debenture stock subject to the provisions of the Companies' Clauses Act, 1863, and section 36 of the Company's Act of 1898. The dividends on the new capital are 7 per cent. if it is issued as ordinary, and 6 per cent. if as preference. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The New Tredegar Gas and Water Order has already been noticed so far as the provisions relating to gas supply are concerned (*ante*, p. 145). For purposes of water supply, the Company require authority to raise additional capital not exceeding £2000, including premiums; but the entire water capital is not to exceed £9750 without special sanction. The dividends on the new issue are to be 7 per cent. if ordinary and 6 per cent. if preference; and borrowing powers to the extent of one-fourth are required, the interest on the money thus raised to be 5 per cent. as a maximum. Shares or stock not disposed of by auction or tender may be offered to shareholders, employees, or consumers. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The following Orders have been applied for to the Secretary for Scotland, under the provisions of the Private Legislation Procedure (Scotland) Act, 1899.

The Glasgow Corporation Order is (*inter alia*) to sanction the acquisition by the Corporation of the undertaking of the Busby Water Company, who, by Acts passed in 1875 and 1882, were authorized to construct works and supply with water the village of Busby and the adjacent districts, in the parishes of East Kilbride and Carmunnock, in the county of Lanark, Mearns, in the county of Renfrew, and certain other districts and places in the parishes of Cathcart and Eastwood. An agreement has already been entered into between the Corporation and the Company for the sale of the undertaking for £29,763, *plus* the value of the stores on the 28th of May next, and the cost of new works and additions constructed and carried out (including pipe-laying) between May 28 last year and the date of the transfer. Notwithstanding anything contained in the Glasgow Water Acts, the Corporation ask for power, within the limits of supply of the Company, and in intermediate and adjacent places, to furnish any person with a supply of water for domestic purposes, where such person is not entitled to demand it under the above-named Acts, at rates and on conditions to be agreed upon; and for other than domestic purposes, on terms to be fixed by the Corporation. The supplies in these cases are not to prejudice the service within the Company's limits of compulsory supply. The Acts referred to are to apply to the Corporation; and the acquired undertaking is to form part of that of the Corporation. Borrowing powers are required to enable the purchase to be carried out. [*Parliamentary Agents: Messrs. Martin and Leslie.*]

The Kilmarnock Corporation Water Order is to authorize the Corporation to construct a reservoir on Loch Burn and on adjacent lands, a conduit or pipe-line therefrom to the existing conduit from Loch Burn to the Dunton reservoir, and make an access road. The Corporation seek power to raise, in addition to any other moneys they are at present authorized to borrow, a sum not exceeding £25,000 for the purposes of the Order. [*Parliamentary Agent: Mr. J. Kennedy.*]

The Paisley Corporation Order is to authorize, among other things, the construction of additional water-works, comprising a reservoir on the Rowbank Burn, another on the Rye Water, two aqueducts, and a road diversion, to be completed within fifteen years. Powers are sought to take and impound the waters of certain streams specified and their tributaries; and provision is made for the supply of compensation water. The Corporation wish to borrow a maximum sum of £155,000, in addition to the money they have power to raise under their Water Acts. On the expiration of seven years after the Corporation commence to construct the works, they will form a sinking fund so as to pay off in fifty years all the money borrowed and the funded debt created for water-works purposes under the authority of the Order. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

The Renfrewshire Upper District (Eastwood and Mearns) Water Order is to empower the Committee of the Upper District of Renfrew to construct and maintain water-works and supply water in their district, and also to authorize the District Council to acquire the undertaking of the Busby Water Company. The new works comprise two reservoirs, a filter or filters, and a clear-water tank or tanks, in the parish of Eaglesham, in the county of Renfrew, three embankments, four conduits or pipe-lines, and an access road—all to be completed within ten years. It is proposed that the transfer of the Water Company's undertaking shall be carried into effect on May 28, 1908; and that the price to be paid for it shall be £29,763, *plus* the value of stores and the cost of any new works carried out by the Company between May 28, 1906, and the date of transfer. All the Acts of the Company are to apply to the Council. The Corporation of Glasgow are not to be entitled to supply water within any part of the limits; and their Water Acts are to be repealed so far as they authorize such supply. It is proposed that the special water supply district of Malletsheugh, in the parish of Mearns, shall be absorbed in the Council's water undertaking, as from May 15, 1908. The usual powers are required to lay pipes and supply water for domestic and other purposes; but the District Committee are not to be under an obligation to furnish a supply to any person for less than 5s. in a year. The County Council may impose a public water-rate not exceeding 3d. in the pound. Borrowing powers are required in respect of the works specified in the Order. [*Parliamentary Agents: Messrs. Grahames, Currey, and Spens.*]

A Dust Interceptor and Regulator for Inverted Gas-Burners.

Under a patent recently granted to Mr. Richmond, Messrs. Willey and Co., Limited, of Exeter, are now manufacturing a dust interceptor which, it is claimed, provides an effective check for dust in inverted gas-burners besides regulating the pressure.

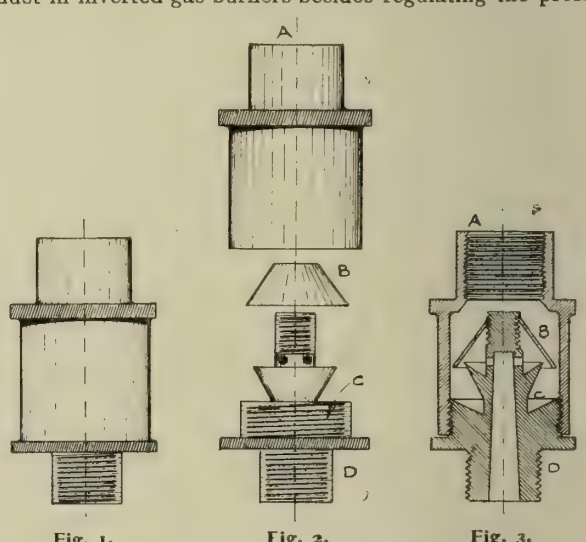


Fig. 1. Fig. 2. Fig. 3.

The construction is clear from the accompanying illustrations. Fig. 1 shows the interceptor complete; fig. 2, the interceptor taken apart for cleaning; and fig. 3, the gas-way. A is the internal thread to screw on the nosepiece of the fitting; and B, the top cone in position to prevent particles of dust from entering the gas-way in the burner and choking—thereby affecting the lighting power. To adjust the pressure of the gas, the cone is screwed either up or down, as required. C is the cavity which receives and retains all the particles of dust; and, once fixed, it will not require cleaning for months. D is the male-thread to screw into an inverted burner.

The Manchester and District Junior Gas Association will assemble next Saturday afternoon to hear a paper by Mr. R. H. Garlick, entitled "Some Observations on Gas Distribution." The meeting will be held in the Manchester School of Technology, Whitworth Street; and the author states that he has prepared his paper with a view of providing ample material for comment and discussion.

THE FIRST FOUR-LIFT (GADD AND MASON) SPIRAL-GUIDED GASHOLDER.

WIDNES is again to the fore. This time it is not a further reduction of the cheapest illuminating gas in the world, but it is in the successful inauguration last Tuesday—in, as an incident in the event, one of the finest gales that ever blew to test the endurance of a holder without outside supports—of a four-lift holder on the Gadd and Mason spiral-guided system. There have been a few columnless holders of greater girth and capacity than the new structure at Widnes; but this one (through circumstances which will be explained) now leads, to the best of our knowledge, in the matter of height for such holders. And Mr. Isaac Carr, the Corporation Gas and Water Engineer, who is responsible for the innovation in height, after his experience with one of smaller dimensions and capacity, has an absolutely composed mind on the question of the continued good behaviour of the holder. There was a little ceremony on Tuesday, and congratulatory speech-making in connection with the inauguration. But before sketching some of the speeches that were especially appropriate to the occasion, the event allows first a little peep into the history of the Widnes gas undertaking, and claims in the next place a description of the holder, with some special reference to its individual features.

PAST AND PRESENT POSITIONS OF THE CONCERN.

The Widnes Gas and Water Works were founded by a private Company in 1860, and in 1867 were acquired by the late Local Board, under the special provisions of the Widnes Improvement Act of that year. At the time of the transfer, the consumption of gas was 13 million cubic feet; and it has since increased to 284 million cubic feet. To meet the additional business, large extensions have been made, which bring the capacity of the gas-works up to 2 million cubic feet per diem, or (say) equal to a consumption of 400 million feet per annum.

The carbonizing plant at present consists of 406 mouthpieces, capable of producing 2 million cubic feet of gas per day. All the retorts are in one house, and in settings of sevens, fired on the regenerative system. Additional land has been acquired to increase the capacity of the works to 3½ millions per diem.

The gasholder storage station, apart from the gasholder just completed, is situated at Ditton, outside the borough boundary, and is 1½ miles from the gas-works. Here is an ordinary two-lift holder of 400,000 cubic feet capacity, and also a three-lift Gadd and Mason columnless gasholder of 700,000 cubic feet capacity, which was erected in 1893. [We will refer to the latter holder again presently, in showing what led up to Mr. Carr adopting the spiral-guided system for the four-lift holder.] The total storage capacity at Ditton is 1,100,000 cubic feet, and, with the new holder added, 2,100,000 cubic feet. There is a 12-inch governor and check meter at the Ditton station, for supplying gas to the Ditton, Halebank, and Hale districts. Sufficient land has been acquired at the Ditton site for the erection of additional works equal to a daily output of 1,500,000 cubic feet of gas.



The New Four-Lift Spiral-Guided Gasholder at Widnes.

The total number of consumers is 6400, of whom 4240 are consumers on the "penny-in-the-slot" system.

The net selling prices of gas within the borough are 1s. 3d. and 1s. 1d., and for motive power 11d. per 1000 cubic feet. Consumers by prepayment meter are allowed 44 cubic feet for 1d., including service, meter, internal pipes, and fittings, with boiling-burner, also continual maintenance.

The illuminating power of the gas is 17 candles, as tested by the "London" argand burner at the 5 feet rate, notwithstanding the fact that the statutory standard is but 14 candles, as it is, in the stated opinion of Mr. Carr, "much to the advantage of the consumer to receive gas of what may be termed an economical quality." To put his contention in other words, had the present low selling prices been obtained by reducing the quality, the consumer would not have been the gainer. The prices now charged are lower than those of any other gas authority in the world.

With regard to the price of 11d. per 1000 feet for power purposes, it is interesting to note that this gas, with a calorific value of 650 B.Th.U., is cheaper than Mond power gas at 3d. per 1000 cubic feet. Widnes gas at 11d. per 1000 feet develops 6 B.H.P. in a modern gas-engine per penny, or say 0·16d. per B.H.P.—a price considerably below that of a high-duty steam-engine, especially when costs of generating are included. Electricity also for power purposes, to be comparable with gas at the Widnes price, must be sold at ⅛d. per unit. There is, under these conditions, a big day consumption of gas—the day demand being almost as much as the night; and for this gas-engines are largely responsible.

The gas undertaking is a public benefactor in another way. It contributes to the relief of the general district rate of the borough by doing the whole of the public lighting free of cost. This amounts to £1915, or equal to a charge of 1·65d. per 1000 cubic feet of gas sold. This, again, is a point that is not generally understood in considering the price at Widnes.

The total capital expended on the gas-works—including the original purchase money—up to March 25 last, was £116,103, of which £36,520 has been paid off through the sinking fund and the profit and loss account, leaving the actual capital at £79,583, or equal to £2 12s. 3d. per ton of coal carbonized, or £280 per million cubic feet of gas.

THE FOUR-LIFT SPIRAL-GUIDED HOLDER.

Turning next to the new holder. It is some years since Mr. Carr decided to depart from the ordinary type of gasholder practice. Requiring a three-lift holder of 700,000 feet capacity, he made careful investigation as to the merits of the Gadd and Mason spiral-guided system. He was so far satisfied with the result of his investigation, that he decided to adopt the system for the then new holder; and accordingly he recommended his Committee to place a contract with the makers, Messrs. R. & J. Dempster, Limited, for a three-lift holder, having a total height, when fully inflated, of 75 ft. 9 in. This was a decided innovation, as up to that time no holder on the Gadd and Mason spiral-guided system had been erected of such a size. Since then experience has shown that the decision arrived at by Mr. Carr was based on the soundest judgment; and although a number of holders have been erected in England and various parts of the world, of heights approaching the first holder, it has again been left to Mr. Carr to go one step further, and erect a holder having an increased height. The original holder was, as mentioned, one of three lifts; the diameter of the inner lift being 110 ft. 9 in., the middle lift 113 ft. 3 in., and the outer lift 115 ft. 9 in. The holder that has now been erected is a four-lift one, having an inner lift 108 ft. 6 in. in diameter, a second lift 111 ft. in diameter, and an outer lift 116 ft. in diameter. The total capacity is about 1 million cubic feet. Whereas the lifts of the first holder were 24 feet deep, the present lifts have each a depth of 26 feet—thus giving to the holder an increased height of over 40 per cent.

It should be explained that the reason the holder was not constructed of a larger diameter was owing to the cramped position of the site, which is bounded on the four sides by a roadway, railway, foundry, and a large culvert. But this type of holder enabled Mr. Carr to make use of his space to the largest possible extent. Had the ordinary type of holder been adopted, the probabilities are that the holder would have been less than 105 feet in diameter, on account of the extra space required for the construction of the tank piers.

It will perhaps be of interest to many of our readers if we examine the construction of the holders, to see what improvements have been effected since the system was first commenced, as they have now had a sufficient trial to demonstrate their practical suitability or otherwise for the purpose for which they were required. One essential point for the success of a spiral-guided holder is that the rotary motion—amounting to one-third the circumference—should be accomplished with absolute freedom of action, so that there is no possibility of an increased pressure being thrown by the holder at any point of its rise or fall owing to the friction between the rails and the rollers. It was found that, in order to accomplish this successfully, it was essential for the

rails to be laid on a perfectly level surface, which was a difficult matter to surmount on account of the joints and rivets in the sheeting of the holder. Messrs. R. and J. Dempster, however, have now successfully overcome this difficulty by means of their patent spiral plate to which the rails are attached. By using this plate, which extends the full height of the lift of the holder, all joints in the sheeting are avoided; and this enables the rails to lie perfectly flat on the spiral plate, which is butt-jointed, with cover plates on the inside. This improvement materially adds to the strength of the holder to withstand heavy gales or snowstorms; and this alone has undoubtedly increased the popularity in which this type of holder is held by the gas profession.

One of the contingencies of the revolving motion of the holder is that, in the event of a strong formation of ice inside the tank, there is some risk of it overturning the inlet-pipe, unless proper precaution be taken against it. In the tank just constructed, a column of concrete is carried up round the pipe of sufficient strength to resist any lateral stress that may come upon it from ice thrust—thus rendering the pipe perfectly secure.

A further advantage that the flat plate previously referred to possesses, may not occur to one on a casual glance at the holder. But the makers have found that, where the spiral rails are attached either to the sheeting or to stronger plates, the steel rail cannot be satisfactorily bedded to the shell. Hence it follows that, when the water flows down the outside of the vessel from the crown, it percolates between the steel rails where they pass over the joints in the sheeting, and continual rusting takes place. It is impossible to prevent this, except by removing the rails and painting the sheets behind them.

Another patented improvement should also be noticed in this latest Widnes holder—this being the means that have now been adopted to prevent the unsightly appearance which holders have when fully inflated, owing to the action of the rain running down the side of the holder from the crown. This has undoubtedly spoiled the appearance of many holders shortly after having been painted; and in order to get over this difficulty, a novel arrangement has been adopted by extending the top sheet of each lift so as to form a basin round the crown or dips of the holder—openings being provided at each rail, so that any water accumulating can run down the rails into the cups or tank of the holder. It has been observed in spiral holders, that the paint on the part of the shell protected by the diagonal rail is in excellent condition long after the portion exposed to the dripping from the crown has rendered another coat necessary. This applies to ordinary holders as well as to spiral; but owing to the fact that the deposit from the crown is washed evenly over the sides, it does not present itself in such a vivid manner as when observed on the spiral type. This patent, which was illustrated in the "JOURNAL" for Dec. 5, 1905, p. 689, provides for the water being taken from the crown into the interior of the gasholder, should it be found desirable, so as to allow the circular ring round the top curb being continuous; and other means are also provided to this end.

Still comparing the holder with the one at the Ditton station, a further improvement is the increase in the number of spiral guides in the lower lifts, which increases the strength of the grip of the holder to the tank as the height increases. The number of rails on the top and second lifts is twelve, eighteen in the third, twenty-four in the bottom. This is especially important in this case, seeing that the holder extends to a height of 110 feet, or higher than any other columnless holder.

Reviewing these gasholders from their inception, the first one erected at Northwich had the steel rails on the inside of the lifts of the holder and inside the tank—the guide-rollers operating from the curbs and cups. This, of course, prevented inspection, and, this being desirable, the first Widnes holder had the steel rails fixed on the outside of the shells, and the guide-rollers on the dips and the top of the tank. But the difficulty was then experienced of satisfactorily securing the rails to the light sheeting; hence the spiral rail patent which has been so successful.

There are now upwards of 200 gasholders in operation; and it has been found at works where both types of holders are in use that, during heavy gales, it is desirable to turn on the gas from the spiral holder to the town, so as to ensure an even pressure, for, however carefully an ordinary gasholder may be controlled and the carriages adjusted, it is impossible, in Mr. Carr's experience, for it to resist movement during heavy wind pressure, whereas such oscillation is impossible on the spiral principle. The latter offers the same advantage so far as snowstorms are concerned; for the ordinary type may, through heavy drifts on one side, become tilted, whereas this is impossible with a spiral holder even if it is unequally loaded. During the heavy snowstorm experienced in Christmas week, an ordinary holder was practically wrecked at Farnworth, owing to snow drifting on the crown.

The elaborate steel guide-framing used in the construction of ordinary gasholders is a serious matter to keep in proper order, particularly in a manufacturing district, where the effects of the atmosphere upon the ironwork is considerable. Spiral holders dispense with this constantly-recurring cost, for the shell only needs painting; and this can be done from the top of the tank—thus avoiding any risk on the part of the workmen, and ensuring that the parts are properly covered with the material. Furthermore, when a spiral holder is out of action, there is no superstructure above the ground, which is necessary with an ordinary holder. This, in some busy districts, is a disadvantage to the inhabitants; for, though the holder itself may not be required, the superstructure must remain, and interfere with their view.

The cost of the new holder and tank has worked out at a little over £8 per 1000 cubic feet, which may be regarded as a record price for a holder of 1 million cubic feet capacity. The tank, which is of brick, set in cement mortar with puddle backing, is 118 feet in diameter and 26 feet deep.

The contractor for the tank was the late Mr. John Taylor, of Widnes and Garston, who unfortunately died shortly before the contract was completed.

THE INAUGURATION OF THE HOLDER.

As if to afford testimony of the power of a spiral holder of four lifts to withstand the stress of high winds, something approaching a hurricane set in just about the time appointed for the opening ceremony last Tuesday, at which the Mayoress (Mrs. S. Owens) was to take the central part. During the function she had the support of Mrs. Graham, Mrs. Carr, Miss Owens, and Miss Carr. His Worship the Mayor (Alderman Owens) and the Chairman of the Gas and Water Committee (Alderman Timmis) were accompanied by Mr. Benjamin Brown, formerly the Chairman of the Committee, and several other members of the Corporation. Among the visitors were Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, Alderman Jennison, also of Manchester, and a number of Mr. Carr's neighbouring gas *confrères*. Mr. Charles Dempster and Mr. J. W. Scott were there to represent Messrs. R. & J. Dempster, Limited.

The party that assembled near the outlet-valve of the holder shortly after noon was a numerous one; and without delay Alderman Timmis invited the Mayoress to start the holder on what it is hoped will be long and excellent service for the town. Of course, it could not be expected that a lady could tug at the wheel of a 24-inch gasholder outlet-valve; and so, by a happy thought, the valve was locked in position by a heavy chain, and the ends of the chain were clasped together by a gold bracelet, composed alternately of fine chain work and four larger connecting links—the latter being symbolic of the number of lifts in the holder. The ends of the bracelet were fastened by a gold padlock with key—the padlock having enamelled upon it the borough coat of arms. It is a beautiful piece of work. The case for the bracelet has a silver plate on the top, on which is inscribed—

BOROUGH OF WIDNES.

To the Mayoress of Widnes, Mrs. OWENS, from the Gas and Water Committee, on the Inauguration of the New and First Four-Lift Spiral-Guided Holder.

Jan. 29, 1907.

The Mayoress unlocked the miniature padlock, released the hand-wheel, and, by the assistance of one of the workmen, gas was soon passing from the holder into the town. The successful starting of the holder was followed by lusty cheering.

On behalf of the Gas and Water Committee, the Chairman asked the Mayoress to accept the bracelet; and he gallantly but ineffectually essayed to fasten it upon Mrs. Owens' wrist. The spirit was willing, but the skill at negotiating such things as bracelets was lamentably weak, and a lady had to complete the work. That was the only failure or deficiency in the whole day's proceedings. The holder having been declared open, the Chairman moved that a vote of thanks be passed to the Mayoress for the part she had so kindly and gracefully taken in the function. The motion was duly seconded, and endorsed with acclamation by those present. On behalf of the Mayoress, His Worship said that Mrs. Owens was most delighted to be associated with the opening of the holder, which, she hoped, would answer all expectations, and be a very useful adjunct to the industry of the town. She also desired that he should express her appreciation of the kindness of the Committee in presenting her with such a very beautiful memento of the occasion.

The visitors then walked round the holder; and in so doing, the wind strengthened the conviction that the holder stands in a very exposed position; but it was standing so firmly and without any visible tremour the trial to which it was being put, that there is every ground for confidence in saying it will withstand any stress that is likely to be brought upon it. The explanation already given as to why Mr. Carr could not increase the diameter of the holder instead of raising the height to obtain the capacity was understood more clearly when the environment of the site was seen. Many details already referred to were inquired into by the gas engineers present; and a point elicited was—and it is due to the contractors to say it—that, when the holder was finished, so well had the work been done, that there were only a few minor leaks in the crown that claimed attention.

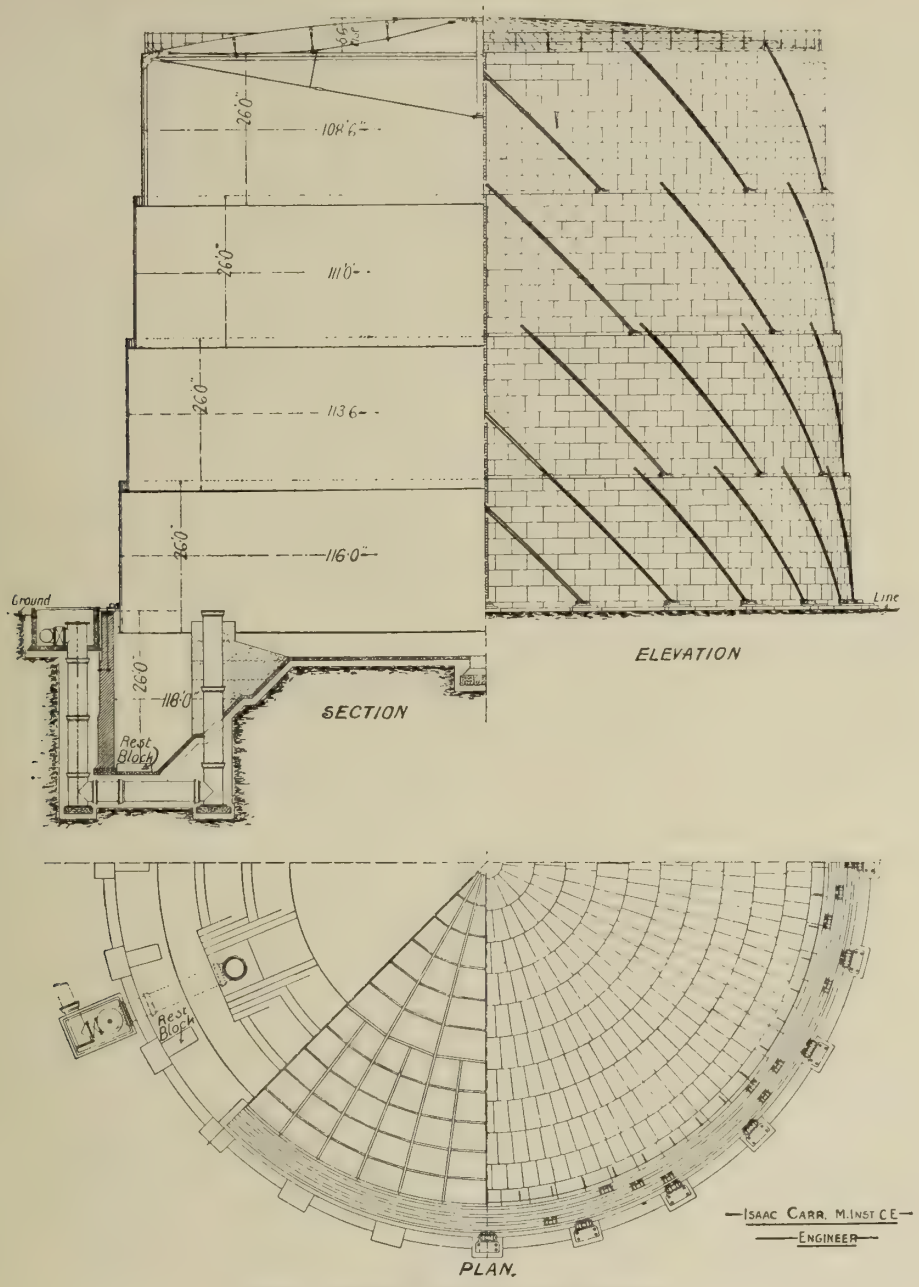
AN INAUGURAL DINNER.

Following the inspection, there was a dinner at the Town Hall to celebrate the event, and subsequently several toasts were proposed.

The loyal toasts having been honoured,

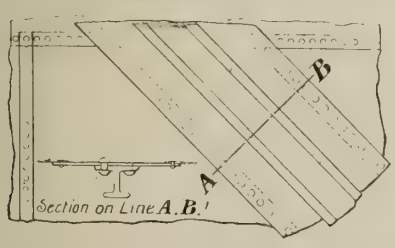
Mr. BROWN, the predecessor of Alderman Timmis in the chair, proposed "The Gas and Water Committee." He said some very complimentary things about the work of the Committee and their Engineer, and observed that he believed the success that attended the Committee's work tended largely to increase the manufacturing interests of the town. His impression was there was no other town in the world that got its gas so cheaply as the ordinary and industrial consumers did in Widnes.

Alderman TIMMIS heartily thanked those present for the enthusiastic reception given to the toast. As Chairman, he appreciated very



Widnes Corporation Four-Lift Spiral Gasholder.

much the fact that he had an excellent Committee; for without such a Committee it would be altogether impossible for the Chairman to carry out the schemes placed before them by the Engineer. He reminded those present that it was thirteen years since the Corporation put down the first columnless holder in Widnes. That was then a very great departure, and was largely in the nature of an experiment. It caused a great deal of anxiety at the time, as there seemed to be some risk in departing from all previous types of holders—especially in putting the holder up, as they did, in such an exposed position as on Ditton Marsh. He came to the conclusion then that, if the holder would stand in such a situation, columnless ones would stand anywhere. Therefore they had put the new four-lift holder up without any misgivings whatever. The Committee were perfectly satisfied that it was the right thing and the right principle in gasholder construction. The new holder was 111 times bigger than the first one erected in Widnes.



The Chairman then supplied some of the particulars which have been incorporated in the account we have given as to the past and present history of the gas undertaking. He also referred, with pardonable pride, to the price of gas—mentioning that it was 1s. 3d. and 1s. 1d. per 1000 cubic feet for lighting purposes, and 11d. per 1000 cubic feet for motive power. Despite this low price, they managed to make quite considerable profits, out of which they contributed to the relief of the rates the cost of lighting the town by gas. The sum charged last year against the Department for this purpose was £2000, or equal to 1·65d. per 1000 cubic feet of gas sold. He also alluded to the coincidence that, in that morning's "Daily Telegraph," there appeared a leading article alluding to the fact that the first gas-lamps were lighted in Pall Mall the previous evening 100 years before.

Mr. Bullough submitted the toast of "The Contractors." He regretted that Mr. Taylor, the Contractor for the tank, had passed away. Subsequent remarks showed how greatly he admired the principle on which the holder was constructed. With regard to Messrs. R. & J. Dempster, they appeared to have done their work remarkably well; and it was a credit to them.

The Development of the Spiral-Guided Holder.

Mr. J. W. Scott (on behalf of Messrs. R. & J. Dempster) responded, and made a most interesting speech on the development of the spiral-guided holder. In the first place, he also expressed his sorrow that Mr. Taylor, the Contractor for the tank, had passed away. But this he could say, that the tank and the part of the work that Messrs. Dempster had to do with fell together splendidly. He had been associated with the construction of spiral-guided holders since their inception; and therefore some remarks from him on the subject might be of interest. Owing to the very elaborate character of the framing of ordinary holders that had been reached before the introduction of spiral guides, it was a difficult matter to persuade an engineer that such a vessel could be constructed stripped of all its elaborate trimmings. However, thanks to progressive engineers of the type Widnes possessed, the system became established; and, like all other new ideas, it had progressed with the times. Originally all the guide-rails were fixed internally. But, being inaccessible, they were on the first Widnes holder secured to the outside; and in either case difficulties were presented in attaching the strong rails to the light sheeting. In the gasholder the Mayoress had inaugurated that day, a strong plate was fixed directly behind the guides, and the rails were firmly secured to it. This was considered a great improvement in many ways; but as proving the soundness of the invention, the first gasholder erected on the spiral principle at Northwich, under the supervision of Mr. T. Newbigging, had never once been out of action. Further improvements were embodied in the Widnes contract, for the side plates were extended above the top curb, so as to collect the water or other deposit that formed on the crowns of gasholders in all manufacturing districts, and direct it down the spiral rails—thus preserving the paint on the sides and preventing disfigurement. Mr. Carr entrusted to the firm he (Mr. Scott) represented the order for a three-lift holder in 1893. At the time that was the largest holder on the system. They had now completed the first four-lift gasholder, so Mr. Carr still held the record; and had he not decided upon a spiral, his storage would have been considerably

less, owing to the exigencies of the situation. The saving in cost was not only upon the holder, but also upon the tank, which in large holders was far more easily constructed, and much less brickwork in proportion was required. An annual saving was effected in the cost of painting; for, in a locality such as Widnes, all exposed superstructures must suffer, and it was a very dangerous and costly matter to properly scrape, scale, and paint the intricate steelwork that even such a gasholder as this would require. The gasholder was fixed in the centre of a busy district, but it would only monopolize the view so high as it might be inflated. This was to many an important factor; for, if an ordinary framed holder had been fixed, even if the vessel was out of action, the superstructure would have been there, blotting out the view. Many works could throw their holders out of action during the summer; so if this one could be spared, it would rest in the tank unobserved. It had become the custom where spirals had been erected, in the event of a rough night, to turn them on the town; for they were the steadiest under all conditions, and were free from even the influences of the snowload such as, during Christmas week, wrecked an ordinary gasholder and damaged others even in Lancashire. There was a very large gasholder in this country that was intended to be an example of the length to which gas storage could be carried. It was found, however, that it was impossible to work the inner lift alone, and risky to uncup the second, for the lifts were too shallow for the diameter, although they were 30 feet deep. They could construct a spiral holder 500 feet diameter, and only 2 feet deep, and yet have entire control. Hence for large holders, the spiral opened out possibilities hitherto unknown. It was an all-British "job" right from the patentee. Mr. Gadd was a Manchester man, and they admired him. The improvement patents were by Manchester men; and the material was all British. Upwards of 200 of the holders were at work; and so long as Messrs. Dempster controlled the patents, they would assure themselves that spiral holders were synonymous with safety. The ratepayers, he felt sure, would agree with their Engineer that they had a safe and sound investment in the new holder; and Mr. Carr claimed another record to the long line he had already made.

Electricity Consumers Benefit from the Gas Profits.

Alderman Gibson, the Chairman of the Manchester Corporation Gas Committee, in proposing the toast of "The Engineer," said it afforded him great pleasure to be present there that day, not only to pay his respects to the Borough and to the Mayor, but also to their Engineer, who had unfortunately got a reputation. He (Alderman Gibson) was pleased to hear of the progress made by the gas undertaking in Widnes; and his Worship would be equally pleased to hear that in Manchester they had made progress quite equal to Widnes. When he came to Widnes, he felt himself rather a great man—a *persona grata*—for he had been Chairman of his Gas Committee for twelve years. On this he flattered himself a little bit; but he found that Alderman Timmis had been Chairman from thirteen to fourteen years. However, it seemed a very strange thing to him, and probably more so to him than to those who administered the gas affairs of Widnes, that, in spite of Mond gas, suction gas, and electricity, still the Manchester gas undertaking had increased year by year; and this last year they had done a much larger business than they had ever done before, in spite of the great opposition that had been offered to them—an opposition that he thought in some cases was a little unfair. Their electricity was supplied by the same funds as the gas; but the Gas Department were compelled to take a thousand pounds a week out of their profits for the purpose of giving it to the rates. The Electricity Committee did not give anything at all to the rates. This he conceived to be very unfair competition, because not only did they not contribute to the rates, but they were allowed to sell their product at any price they liked, and in some cases for less than they could produce it. He held that it was quite unfair that they should put their hands in the pockets of the gas consumers, *nolens volens*, and take out thousands of pounds a year, and give it to other people. He went to the trouble a short time ago to take out the names of 21 large ratepayers in Manchester none of whom consumed gas, but all of whom consumed electricity; and yet they put their hands into the pockets of the gas consumers, and of the total sum taken transferred £1114 a year into the pockets of these particular electricity consumers. He repeated that this was unfair and unjust; and they had no right to do anything of the kind. They had a right to sell their commodity on the best terms—the lowest possible price that they could—without any consideration for anybody else. They should use every effort to do all they could to oblige, to accommodate, and to satisfy their own consumers. In his younger days, he was very anxious to have everything as near perfection as possible; but since he had got older, he was perfectly satisfied with success. He did not care so much now for aiming at perfection; but he did like success. And in business the greatest success was to be achieved by doing the best one could for his customers. The greatest trouble came upon the poorer class of the people, who were suffering because they were charging them for gas 4d. per 1000 cubic feet more than, under other circumstances, they would need to do. When the gas department contributed to the rates, they were benefiting the rich, who, if they had to pay 3d. more upon the rates, would be pounds a year in pocket if they had to pay 3d. more on the price of gas. In Manchester their gas operations were on a very large scale. They carbonized about 500,000 tons of coal a year. They were now speaking of building a new gasholder. While he believed in spiral-guided holders, he did not know how he should look upon one of 10 million cubic feet capacity, which was the size they were proposing now to erect. He had a personal acquaintance with Mr. Gadd; and it was a great number of years ago when he had some serious conversation with him on the subject of spiral guiding. He was glad Mr. Gadd had been successful. Alderman Timmis had spoken of the centenary of a most interesting event in the history of gas lighting. He (Alderman Gibson) always took credit for Manchester, as being the first city that ever secured parliamentary powers to enable them to supply gas for lighting purposes. This was something of which they had reason to be proud; and he had also thought that the first gas-lamp was lighted in King Street, Manchester, about that time. Respecting the toast of "The Engineer," he did not know that he ought to be expected to speak in the most friendly terms of Mr. Carr. He (Alderman Gibson) often had to meet the inquiry, "Why cannot you produce gas in Manchester as cheaply as Widnes? With all your resources in Manchester, you ought to do as well as Widnes." He had said the answer was very simple. There was only one Carr; and he was in Widnes, and that was about the history of the whole thing. He believed that Mr. Carr was a great economist; and he did not suppose Mr. Carr would spend a penny on the gas-works when he could do quite as well with a ½d. That was very creditable to Mr. Carr. He had the greatest pleasure in congratulating him upon the reputation he had attained, and the Corporation upon having him.

Results of Economy.

Mr. Carr, in replying, said he was exceedingly obliged for the kind words that had been used respecting the work that he had carried out, and to those present for the cordial way in which they had responded to the toast. The work at Widnes, he need not tell them, was one that he had deeply at heart; but his work would not have achieved the success it had done if it had not been for the excellent Committees that he had had from time to time. He had been fortunate in winning and keeping their confidence. The proposals he had put before them from time to time they had accepted, and had given him an absolutely free hand in carrying them out, both in the gas and the water works. They had the result of the confidence of the Committee in the unparalleled positions of the undertakings that day. When he came to Widnes nearly a quarter of a century ago—a quarter of a century on the 1st of November next—both the gas and water undertakings were charging very excessive prices for their commodities, and also (to put the point mildly) they were overcapitalized. The capital at that time amounted to between £800 and £900 per million cubic feet of gas sold. "Enterprise" had since been their watchword. The gas consumption was 60 millions at the time of his appointment; it would this year be 320 millions. The old works had disappeared; new ones had taken their place. And as Alderman Gibson had said, the extensions had been carried out, with of course due regard for efficiency—certainly without spending 1d. where ½d. would suffice. With regard to the new holder, he should have liked to have made it of larger diameter. He wanted a million cubic feet holder; but local conditions prohibited him obtaining that by having a gasholder of larger diameter. However, as an old friend of his used to say "There is no charge for going up higher." He (Mr. Carr) thought this was the way out of the difficulty, and of obtaining the million cubic feet holder that he desired. When he looked at the costs of their most recent holders, the cost of the first large one that they built—of 400,000 cubic feet capacity—worked out to £18 12s. per 1000 cubic feet. He did not consider this was an excessive price for a holder of that size. Then they erected the spiral-guided holder at Ditton, which was the first three-lift spiral ever erected, and that worked out to £11 per 1000 cubic feet. In the present four-lift spiral, they had established a record, for the cost was equal to £8 per 1000 cubic feet. Not only did they save in capital cost, but they had an annual saving in the expenditure required for maintaining external guide-framing. Before the acceptance of the tender for the spiral-guided holder, he designed a steel framing that it would have been a delightful thing for him to have seen standing, a monument for all time, to his work. They obtained tenders for the externally guided holder, and for a columnless one. The price for the externally guided holder was £1 per 1000 cubic feet capacity more than the columnless one. He (Mr. Carr) put his vanity in his pocket, as he saw that the right thing to do was to accept the cheaper holder. He was perfectly certain that day it was not only the cheaper but the safer. With his experience extending over such a long period with this class of holder, he believed the spiral form of guiding gave them as strong a structure as, or even stronger than, an externally guided holder. Mishaps had frequently been heard of in connection with externally guided holders; but he had yet to hear of the first accident with a spirally guided one. The late Mr. John Taylor, the contractor for the tank, had carried out his work up to the time of his death with his characteristic excellence; and he (Mr. Carr) shared the regret with many others that he was not present that day to witness the satisfactory completion of his work. The contractors for the holder (Messrs R. & J. Dempster, Limited) had also carried out their work in an exceedingly satisfactory manner. He had never, in the whole course of his experience, been associated with the erection of a gasholder where the work, from the outset to the testing, had proved so thoroughly sound and true.

The Mayor proposed "The Visitors;" and Mr. Edward Allen (of Liverpool) and Alderman Jennison (of Manchester) responded. "The Health of the Mayor" was also heartily drunk, at the instance of Alderman Quinn.

Analyses of British Coals and Coke.—Those of our readers who see the "Colliery Guardian" will probably remember that a feature of its pages during 1902 and the following years was a collection of analyses of British coal and coke. The articles aroused so much interest that it was deemed advisable to enlarge their scope, and to compile a work which would not only be worthy of the importance of the subject, but would contain, in addition to the analyses themselves, information upon the classification of coals, the interpretation of analyses, and the characteristics of the coal seams worked in the British Isles. The idea was carried out, and the result has been the production of a volume of "Analyses of British Coals and Coke," a copy of which we have received from the publishers, the Chichester Press. It contains upwards of 1000 analyses, occupying 444 quarto pages (7 in. by 9½ in.); and the particulars are arranged so as to allow for marginal notes. They are compiled by Mr. Allan Greenwell, F.G.S., Assoc.M.Inst.C.E., the Editor of the "Colliery Guardian," and Mr. J. V. Elsden, F.G.S., B.Sc.; and they are preceded by an introduction by Mr. Clarence A. Seyler, B.Sc., F.I.C. dealing with the first two of the additional subjects above named. The analyses are accompanied by commercial indexes and a map, and form a valuable collection.

MIDLAND JUNIOR GAS ASSOCIATION.

The February Meeting of the Midland Junior Gas Engineering Association was held on Saturday, at the City of Birmingham Technical School—Mr. G. W. G. Tatam, the President, in the chair.

Mr. A. N. Comely (Windsor Street) read a paper entitled "Refractory Materials Used in Gas-Works," the principal portions of which are given below—the parts omitted consisting of details of the process of manufacture of fire-bricks and fire-clay goods. Mr. Comely was able to show the members numerous specimens of materials, models of retorts, &c., which had been forwarded by Messrs. George K. Harrison, Limited, of Stourbridge; and in addition to this he sketched on the blackboard a section illustrating the position of the Old Mine seam and some of the New Mine seams of Stourbridge clay.

REFRACTORY MATERIALS USED IN GAS-WORKS.

The chief refractory materials at present used in gas-works are fire-clay and silica. Fire-clay goods are used for the piers and arches of retort-benches; the producer, the retorts, the transverse walls, and the regenerator of regenerative settings; the linings of the generator, carburettor, and superheater of water-gas plants; and the seating blocks, &c., of boiler settings. Silica goods are used in some cases for the lining and arch of the producer, and as a general rule for the whole of the zone of combustion in gaseous-fired settings. In all these places, the importance of good material is obvious; for it is certain that, given the best of designs (say) for a regenerative setting, if it be built with bad material, failure is inevitable.

At this point, it will be well to obtain a clear idea as to what characteristics a good refractory brick should possess; and then when the impurities of clays are dealt with, their influence upon these characteristics will assume its proper importance. The following are the main qualities essential to a good refractory brick: (1) Refractoriness—that is, the capacity of resisting the highest temperature likely to be experienced in the position in which it is to be used, without softening or undue contraction. (2) Toughness—that is, freedom from splitting when exposed to changes of temperature. (3) Density—that is, power to resist pressure due to the weight of superincumbent material.

As to (1), about 1200° C. is the highest working temperature for the best brands of fire-bricks, and about 1700° C. for silica bricks. At temperatures higher than 1200° C., fire-bricks will shrink and soften. This softening is partially due to the pressure of the upper layers of bricks, and to the presence of iron, alkalies, and sulphuric acid in the dust and vapours from the fuel reacting upon the softening brick, and promoting fusion. Thus, as is well known, nostrils and passages become closed up. Analyses of various fluxed portions showed in one instance upwards of 30 per cent. of iron; while the flue ash contained 47 per cent. of iron and 33 per cent. of sulphuric acid. Silica bricks are not affected in this way to the same extent; but as to (2)—*i.e.*, toughness—they are more likely to split, unless the "bond" of the brick is particularly good, and great care is taken in raising and lowering the heats. With regard to (3)—that is, density—the crushing weight of an ordinary fire-brick is from 600 to 1000 lbs.; but some of the best brands will stand 3000 lbs.

Bricks for carburettors and superheaters of water-gas plants, though not required to be very refractory, need to have this characteristic in particular—viz., freedom from oxide of iron. The reason is that the hydrogen and carbon monoxide in the crude water gas exert a powerful reducing action on any iron, manganese, or their oxides present in the bricks; free carbon being deposited in the pores of the material. In time, disintegration results; rendering frequent renewals necessary. For instance, at one large works 25 per cent. of the chequer-bricks in the carburettor were rendered useless after only 16 weeks' work.

Clay is not by any means a definite substance; and the term includes a number of materials of varying composition, as well as of different origin and different modes of formation. The purest clay is kaolin or china-clay. It is white, and was probably formed by the decomposition of felspars, and the washing away of their alkalies—soda and potash.

Fire-clay represents, no doubt, an ancient soil, and has lost its alkalies to the vegetation which grew upon it in that remote period. In no place is the evidence in favour of this view more abundant and clear than in the Yorkshire coalfield. Descending through the measures, a fire-clay or ganister is found beneath coal after coal, with remarkable regularity. Further, in the underclays it is quite a common thing to find a mass of clay literally crammed with ribbon-shaped markings of the roots of Sigillaroid plants.

All fire-clays as they occur in Nature, are essentially hydrated silicates of alumina, and when pure correspond to the formula Al_2O_3, $2SiO_2$, $2H_2O$. In other words, a pure clay, before burning, should contain: Silica 46·5 per cent., alumina 39·5 per cent., and combined water 14·0 per cent. A clay of this composition would begin to soften at about 1830° C. The nearest approach to purity is found in china-clay, the composition of which varies generally between: Silica 50 to 65 per cent., alumina 25 to 35 per cent., and combined water 10 to 14 per cent. This combined water is a most important constituent, as upon its presence depends the plasticity of clays. Clays also contain hygroscopic water, which may be driven out by heating at 100° C., without lessening their plasticity; but if heated to redness, both the hygroscopic and the combined water are expelled, and the clay ceases to be plastic. Other things being equal then, a fire-clay which has (say) 8 per cent. of combined water, will be more plastic, and the finished article will have greater tenacity or "bond" than one having only (say) 5 per cent.

The silica in clays may exist in three forms, as shown by the analyses of four clays given below:—

—	No. 1.	No. 2.	No. 3.	No. 4.
Silica, free, as sand	56·95	47·40	29·63	16·20
,, combined with bases	18·69	26·98	37·74	45·53
,, as hydrate	1·39	1·06	0·91	1·05
Total silica	77·03	75·44	68·28	62·78

The free silica may be present as sand or in a much finer state of division; and it is to this free silica that the grittiness of a clay is due. The size of the particles of silica, also, has a distinct effect upon the refractory value of a clay. For instance, of two clays, alike in other respects, that which has the greater proportion of coarse particles will be more refractory than the other, and less liable to split if exposed to changes of temperature. The other constituents of fire-clays are best indicated by the following table of analyses:—

Locality.	SiO_2.	Al_2O_3.	KO.	CaO.	MgO.	FeO.	H_2O. Combined.	H_2O. Hygroscopic.
Stourbridge—								
Old mine, best selected	76·85	16·59	0·66	0·10	Trace	0·79	5·01	..
Do., ordinary	56·85	26·58	1·68	0·20	0·34	2·35	12·00	..
Dowlais	67 12	21·18	2·02	0·32	0·84	1·85	4·82	1·39
,,	53·05	28·13	4·19	0·17	1·20	2·48	5·82	2·20
Glenboig	65·41	30·55	0·65	0·69	0·64	1·70	..	.
Dinas	96·73	1·39	0·20	0·19	..	0·48	0·50	..

From these analyses it will be seen that the chief impurities usually found associated with fire-clays are the alkalies and oxide of iron. The oxide of iron is generally in the form of nodules of clay ironstone. This ironstone is partially oxidized during weathering, and completely so on burning, and is the cause of bricks sometimes being mottled on the surface with dark spots. It lowers the refractory value of a clay to a serious extent by fluxing with the silica, and is therefore most dangerous.

With regard to the above analyses, these points may be noted: No. 1 is a very good refractory clay, with a low percentage of alkalies and iron. No. 2 is about ordinary Stourbridge quality; and, having 12 per cent. of combined water, it would be more plastic, but with its higher proportion of alkalies and iron, it would not be as refractory as No. 1. No. 3 is best Dowlais fire-clay. No. 4 melted down on the bridge of a ball-furnace, and shows plainly the influence of alkalies in promoting the fusibility of a clay. No. 5 is a fire-clay with an excellent reputation. No. 6 is a highly refractory siliceous rock; and on account of the small proportion of combined water, it needs the addition of a fluxing agent—such as lime—to be the necessary binding material in the finished brick.

From the above, it will be noticed that it is possible to indicate the quality of a clay from its chemical constituents. But even when a physical analysis is given in addition, it still needs an actual test by fire to enable a complete judgment to be arrived at. Such a test is made by moulding a sample of the ground clay into the shape shown, and subjecting the piece to a temperature slightly higher than that which the goods will be required to withstand. The edges or arrises should afterwards be carefully examined. If they continue sharp, the clay is refractory; if much rounded, it is an evidence of some incipient fusion. Sample bricks may, of course, be tested in a similar manner; one having sharp edges being selected for the purpose, and a sheet-iron template being cut to fit it exactly, so that the contraction may be accurately measured. A suitable form of experimental furnace for testing clay or bricks in this manner is made by Messrs. Fletcher, Russell, and Co. for use with the oxy-hydrogen flame.

Fire-clay is "mined" in much the same way as coal, and several measures of clay are often found in the same mine—their composition and quality varying one from another often to a remarkable degree, as, indeed, is sometimes the case even when from the same continuous seam. The first stage in the manufacture of fire-clay goods, after the clay has been mined, is that technically known as "weathering." This is a most important stage, and one which has a very definite influence on the quality and refractoriness of the finished goods. It consists in tipping the raw clay out of the small waggons or "tubs" in which it has been raised from the pit, to form long stacks or "banks." Once or twice each day during dry weather the bank is well watered; and after some months the hard lumps of clay become disintegrated and fall to powder. Opinions differ as to the length of time it is necessary that the clay should be exposed; but eighteen months is usually considered as the minimum period desirable.

After weathering, the clay is taken to the grinding mill, where a proportion of burnt stuff, necessary to keep the contraction within reasonable limits, and to make the resultant goods more open, is added. The amount will depend upon the natural plasticity of the clay and the kind of goods to be made—a strong clay allowing of the addition of a much larger quantity than a less plastic clay. As a general rule, for bricks one part of burnt clay or old fire-bricks will be mixed with from three to four parts of raw clay; and for retorts, one part of burnt to two parts of raw.

The various sizes of 9-inch bricks most commonly in demand are made either by hand or machine; and after that comes the drying, which is carried on in sheds. From the time the goods are put on the floor in the "green" state until they are dried "white-hard," and are ready for removing to the kiln, is, in the case of 9 in. by 4½ in. by 2½ in. bricks, about four days, and tiles 16 in. by 14 in. by 2½ in. a matter of about twelve days—on account of the danger of them warping or cracking if the drying be hurried. The bricks, when partially dried, are "fettled" or hand-dressed, and then stamped or marked with the manufacturer's name. Blocks and special bricks of large size, such as are required for water-gas plants, are made in moulds on the floor of the drying-shed itself; and if of great thickness, they require extreme care to avoid cracks and warps.

Retorts are of two kinds—moulded and segmental or tile. The former may be either hand or machine made; while the latter are usually manufactured under a steam or a hand-fly press. The plastic clay from which retorts are to be made usually contains about one-third of old fire-bricks which have been broken up and two-thirds of raw clay; the object of this large proportion of burnt stuff being to lessen the shrinkage, raise the refractory value, and keep the grain of the finished retort as open as possible. The mode of manufacture of hand-moulded retorts, in general use in the Midland district, is that known as the "Newcastle" method. It consists in building-up the length of retort required in short sections or "lifts" of from 14 to 18 inches each. One 6 ft. 8 in. in length takes about 21 days to build; and though there may be objections to this method on account of the number of joints, very good retorts can be turned out. For machine-made retorts, the clay used has to be carefully and evenly tempered. The freedom from joints and the great pressure to which the clay is subjected should theoretically produce retorts far superior to those made by hand; but practically the advantage is not overwhelming. In segmental or tile retorts each retort, in cross section, is built up of a bottom tile and (say) five segments, both the transverse and longitudinal joints being usually rebated. There is considerable difference of opinion as to whether segmental retorts are superior or inferior to moulded ones; the advantages of the former being greater durability and ease in patching and repairing, while their chief disadvantages are the cost of original installation and the great number of joints.

While dealing with the manufacture of retorts, it may be well to add a few remarks upon the question of standard sizes of retorts. The advantages which would follow upon the adoption of some standard sections of retorts of the different forms, are, of course, apparent on the slightest consideration being given to the matter. Gas engineers would obtain their retorts at a lower price, and could set new retorts on shorter notice than is necessary at present. Retort-makers would not need to have their present stock of hundreds of different patterns and templates, and could continue making retorts for stock during the winter months and throughout the whole year at a uniform rate. Under present conditions, makers are very busy during the summer, and slack for the remainder of the year; and, as a consequence, the quality of the finished retorts suffers, and the retorts cost the manufacturer more to make. The question of standardization has been brought forward time after time since 1878; but there has up to now been no definite move in this direction. The Germans, in their love for system and uniformity, took the matter up long ago, and have adopted standard sizes for many years. Whatever may be the method of carbonization in the future, at present, at any rate, we are using retorts; and we appear to be likely to be doing so for the next ten years at least. Therefore this question is still an important one, and needs only a mutual agreement among gas engineers as to the best sections to be adopted as standard ones. Then I think that the makers of retorts and iron mouthpieces would gladly carry out and complete the work of standardization.

The final stage in the manufacture of fire-clay goods is "burning." The goods are burnt in kilns; the operation extending over five to fifteen days, according to the class of goods being burned and other circumstances. With regard to the temperature at which goods are burnt, it is most important that this should be higher than they will be exposed to in the retort-setting; otherwise they are bound to shrink. The final temperature of burning is usually judged by sight and test-pieces; but some makers use Seger's cones or Watson's recorders, and burn to a definite temperature of (say) 1200° C.

Glenboig Fire-Clay Goods.—Though the analysis of Glenboig clay in the table already given does not reveal any very striking difference from that of Stourbridge clay, yet there are several features to be remembered. Glenboig fire-clay contains a high percentage of combined water and a certain proportion of alumina, which causes it to shrink very much in drying and firing; but after having been burnt at a high temperature, the material then suffers much less change of volume by subsequent alterations of temperature. Hence Glenboig bricks practically suffer no expansion by heat or contraction by cooling, and do not crack or split off when subjected to currents of cold air.

Silica Fire-Bricks.—By far the greater number of silica bricks are made from the Dinas rock found in the Vale of Neath, South Wales, and its geological equivalent, ganister, found beneath the coal-seams in the vicinity of Wortley and Sheffield. The analyses below show the similarity in the composition of the two rocks :—

	Dinas.		Ganister.
Silica	98·31	..	96 55
Alumina	0·72	..	1 59
Peroxide of iron	0·18	..	0·71
Lime	0·22	..	0·18
Potash and soda	0·14	..	0·53
Combined water	0·35	..	0·85
Total	99·92	..	100·41

These sandstones have undoubtedly been deposited by water; and from the nature of their mineral constituents, it is fairly certain they have been derived from the waste of some granitic rock. The Dinas material occurs in the state of rock and also disintegrated like sand. Samples of bricks made from it, according to Dr. F. Leisse, Chemist at the Cologne Gas-Works, when heated to 1700° C. for fourteen days, expanded lineally from 0·9 to 3·4 per cent. This expansion is somewhat of an objectionable feature, as the bricks have to be loosely set, when being built in the setting, so as to allow them "breathing room." Otherwise, as in one installation of inclined retorts which came under my notice, the middle retorts may be 3 inches higher at the centre than at the ends, due to the expansion of the silica blocks of the combustion chamber. On the Continent, settings have been constructed of Dinas bricks; and it has been found that they will stand letting down and re-firing many times without settling. Also the action of the dust and furnace gases, which are so destructive to fire-bricks when they begin to soften, do not affect Dinas material. Further, Dinas settings, when being heated up, do not show dull zones corresponding to the positions of the cross-supporting walls, as are observed in the case of ordinary fire-brick settings under similar conditions. This points to Dinas material being a better conductor of heat; and the result of a large number of tests shows that, on the average, Dinas goods have 20 per cent. better conductivity than fire-bricks rich in alumina and of fine grain. Of course, bricks made from such granitic material, necessitating it being broken before it can be ground, are as a consequence very costly to make; and this is, so far as I am aware, their only disadvantage. The price of 9 in. by 4½ in. by 2½ in. bricks, f.o.r. Neath, is, roughly, 35 per cent. greater than that of fire-bricks f.o.r. Stourbridge.

Ewell Bricks.—These bricks are made at Ewell, Surrey, and at Chalfont St. Peter's, Buckinghamshire. Their composition is indicated by the following analysis :—

Silica	84·65
Alumina	8·85
Lime	1·90
Magnesia	0·35
Oxide of iron	4·25

They are red in colour, due no doubt to the amount of iron present. They are extremely soft, and can be readily sawn or rubbed down to shape; but they break easily and require handling with great care. They are considered by some engineers to be fairly refractory; but my personal experience of them has not been altogether satisfactory.

Finally, as to the design of fire-clay bricks, blocks, &c. When designing special bricks or blocks for regenerative settings or water-gas plants, it would be well, in my opinion, if the engineer would try to avoid all sudden changes of section or thickness of material, and all sharp internal angles, wherever possible—in fact, to design the blocks as though they were to be made of cast iron, instead of fire-clay, and therefore to round the corners of all openings in tiles, &c. If special blocks are also required to be made in the shortest possible time, then the thickness should be arranged to be not more than 4½ inches or thereabouts, because, if more, the blocks would take a much longer time to dry; and if any attempt be made to hurry this drying, cracks and defective blocks are the consequence. As examples of the length of time necessary for producing good sound bricks, I may say that 9 in. by 4½ in. by 2½ in. bricks need four days for drying, four days' steaming, and seven days for burning and cooling. Tiles 16 in. by 14 in. by 2½ in. require ten days for drying, ten days' steaming, and seven days for burning and cooling.

Discussion.

Mr. I. A. Mobberley (Messrs. George K. Harrison, Limited, of Stourbridge), called upon by the President, said he must congratulate Mr. Comely on his very able and instructive paper. There were one or two points touched upon to which he would like to refer as a manufacturer. First among these was the question of standard sizes of retorts. If gas engineers could mutually arrange standard sizes, he thought it would be both to their benefit and to that of the manufacturers; for, as Mr. Comely told them in his paper, at a certain period of the year the makers were very busy, and during another part they were quiet. If standard sizes were in vogue, these could be made and stocked, and then would be available for drawing upon when wanted. Besides this, the retorts might be made better, owing to there being no need for rushing them. Time was a very important

matter indeed in the fire-brick trade; and he could assure the members that occasionally the manufacturers had a time-limit put upon them which was very unreasonable. He hoped therefore that gas engineers would take this matter into consideration. Then Mr. Comely made some remarks about the Old Mine clay in the Stourbridge district coming to an end. He (the speaker) did not agree with this; for his own firm, at any rate, had got sufficient Old Mine clay to last another fifty years. Personally, his experience was that wire-cut bricks were very much better than other machine-made ones, as there was a rougher surface, to which mortar would better adhere.

Mr. F. J. Bywater (Saltley) also thought that congratulations were due to Mr. Comely, not only on the merits of his paper, but because of the fact that there was really existing at the present time no treatise that dealt with the manufacture of fire-bricks from the practical point of view. He did not know of any such book published in England. It was a most interesting subject, and also a most important one to gas engineers, because they all knew the old adage that dividends were either made or lost in the retort-house; and it was certain that if they did not have a proper furnace, and a tight vessel in which to carbonize and distil the coal, they could not possibly obtain satisfactory results. The amount of scientific study given to the matters dealt with in the paper had been so limited until quite recent years, that there were very few works indeed where bricks were made except by rule-of-thumb. A manufacturer knew that for certain classes of goods what was called a strong clay, or a highly siliceous clay, might be suitable; that for other kinds a mild clay might be used; while for some purposes a judicious mixture of the two might be better. By "judicious," he meant that the manufacturer had to exercise his judgment; and there came in the question of skill. Beyond this, very little was known. The reason why these clays were mixed was not known from a scientific point of view. But now things were on a very much better footing; and in Germany, he thought, there was a lot of valuable research work being carried out. The material that was of most interest to them in the Midlands was that known as Stourbridge clay; and there were several seams of this. The one that had made Stourbridge clay famous all over the world was the Old Mine seam, which was always found under coal, but at varying depths.

Mr. Mobberley remarked that the average depth was about 43 feet.

Mr. Bywater (continuing) said that even the Old Mine seam was not of constant composition. The top of the seam was generally very siliceous; while the bottom was usually mild. The top would, he supposed, contain 70 per cent. of silica, and the clay from the bottom about 50 per cent.; and, of course, the manufacturer mixed them together to get just what he wanted. Besides this Old Mine seam, Mr. Comely had shown them the position of some of the New Mine seams, none of which, however, were so good as the Old Mine. There were a good many of the New Mine seams; and he had seen some very fair bricks made from Seams Nos. 1 and 2; but Seams Nos. 3, 4, and 5 were of very little use except in rare instances. As to identifying from which seam one's bricks were being made, this was a very difficult matter indeed, and required a great amount of practical acquaintance with fire-brick manufacture. There was one thing which might possibly help in this direction—he believed that black Stourbridge clay generally lay with the Old Mine seam. But, of course, one was apt to get a black material which one thought was black clay, and highly refractory, but which might be merely organic matter. Certainly, unless one possessed very special knowledge on the subject, the best thing undoubtedly was to put oneself in the hands of a fire-brick manufacturer who had a good reputation to sustain. The buying of fire-bricks should not be made a mere matter of £ *s. d.* This was a fatal mistake, and caused a lot of trouble. But even after exercising the greatest care, one might possibly go astray, inasmuch as there were firms whose Old Mine seam had been used up, and who had not taken the precaution of buying fresh fields in order to keep up their supply. Then, again, he would advise them never to buy clay from anyone who had not a good stock weathering. In the case of New Mine clay especially, the bricks must be well weathered. The weathering was most important. As regarded the analyses, he did not think the combined alkalies should be more than 2 per cent., while the iron should not be more than 3 per cent., though some clays contained as much as 5 to 6 per cent. of iron, and were fairly refractory, because the alumina was high. This was the case with Glenboig. It was therefore not always dangerous to have a high percentage of iron, if there was not a high percentage of silica—this was what brought it down. If there were impurities or alkalies in the bricks, it could generally be found out if they were well burnt. The iron was reduced in the process of burning. First it became red. They could sometimes, if they broke a fire-brick through, see small red nodules—quite pinky. They were all iron; and if the process of burning was carried to a higher temperature, these all became a vitreous mass. Good fire-brick nearly always contained specks of iron; and by burning well, these generally came out. He did not think it was desirable, as Mr. Comely had said, to build the producer arch of silica. He had seen several so constructed; but they had never been satisfactory. The great thing with silica was that they had to keep the temperature constant; and this could not always be ensured with a producer arch. He would be interested to see the setting built of silica that Mr. Comely mentioned; but he had his doubts as to its general utility. When the heats had been raised and lowered several times, it was apt to crack. In the matter of wire-cut bricks, he did not altogether agree with Mr. Mobberley, although he had seen many good ones. They were liable to split. They had to be of a very fine grain; and this being so, one could not get the open texture which he regarded as necessary to the refractoriness of a brick. For arches or walls and places where splitting could not take place, they were, of course, useful. As to the life of segmental retorts, he did not think there was so much diversity of opinion as Mr. Comely would have them believe. He understood it to be an undoubted fact that segmental retorts lasted nearly double the time that a moulded retort did. The life of the latter was from 700 to 900 days; while that of a segmental retort could certainly be taken as 1400 or 1500 days, if not more. The standardization of retorts was very desirable; but he did not know whether it would ever come about.

Mr. S. T. Smith (Walsall), after remarking that the paper was well worthy of their careful attention, said that Mr. Comely had drawn attention to the method adopted for drying bricks in the course of manufacture; but he hardly thought he had brought out sufficiently the fact that with thick bricks a lot more time was required for drying. He was of opinion that, in constructing a furnace, a drawback to the use of very thick blocks was the uncertainty as to whether they were going to get them thoroughly dried and thoroughly burnt all through. He had seen blocks in a combustion chamber on Mr. Paterson's principle broken up, and they had been black in the centre. This was a condition of affairs that was not wanted in a retort-setting; and it was a thing they could not perhaps solely blame the manufacturer for. Sometimes orders were delayed, and the maker was rushed at the last moment; and the only thing he had to do was to hurry the drying or the burning, which probably meant that the centre of the blocks would not be properly treated. This was a point in favour of using thinner tiles or bricks. Mr. Comely and Mr. Bywater had referred to silica bricks for producer arches. He himself had always understood that silica bricks must not be used anywhere near a furnace. He believed the ashes had a very bad effect on the silica; and he would like to hear some more about the use of Ewell bricks. They certainly stood a good heat; but he thought they failed in respect to the crushing weight. Glenboig bricks, he found, stood the heat; and they also stood firing up and letting down again. He had seen thick blocks of Glenboig that had been in use for seven years, and had not shrunk an inch. This was very well for any fire-brick. Mr. Comely spoke of retorts being either moulded or segmental, and of the method of making them in short lengths. He (Mr. Smith) thought they must not altogether blame the manufacturer if retorts became rough, but must also look to the construction of the setting. A lot depended on whether the retort had sufficient bearing surface. If the cross walls were allowed to be too far apart, the retorts were bound to crack in between. One experienced this more particularly in connection with machine working.

Mr. A. O. Jones (West Bromwich) said Mr. Comely had given them a very exhaustive treatise; and, as Mr. Bywater had remarked, they ought to be much obliged to him for it, because so very little information had been published with reference to fire-clay. To show how small the quantity had been, Mr. Comely had quoted an analysis of Glenboig fire-clay which he (Mr. Jones) thought was originally made in 1875—some 32 years ago—and which had been taken as a standard ever since then. As to the analyses, he should like to ask Mr. Comely, with regard to the comparison between Glenboig and Stourbridge clays, whether they were taken under the same conditions. In one case there was 12 per cent. of combined water, and in the other none; and if the analyses were carried out under the same conditions, this seemed a great difference, and pointed to a very different composition of the clays. As to the standardization of retorts, he thought the main question to decide was whether a certain retort would carbonize effectively a good many different sorts of coal. A retort of a particular section might be suitable for one kind of coal, but unsuitable for another. He thought it was a matter for (say) the Institution of Gas Engineers to make exhaustive inquiries upon, to determine what sort of retort would be suitable for all coals.

The Hon. Secretary (Mr. James Hewett) said there was one point on which he would like information. Mr. Comely dealt with the characteristics of silica and fire-clay; but when he came to density, he simply referred to the crushing weight of fire-bricks. Perhaps he would tell them something about silica under the same test. The point raised by Mr. Jones as to the combined water, struck him (the speaker) at once, because later on in the paper Mr. Comely had referred to the high percentage of combined water in Glenboig fire-clay.

Mr. Comely: The conditions were not the same.

The Hon. Secretary (continuing) remarked that they were getting used to suggestions for the standardizing of retorts; and no doubt it would be a very fine thing if they could carry out some scheme. Mr. Comely said they were likely to be using retorts for the next ten years; and he (Mr. Hewett) did not think many of them would like to start having another section of retorts now, if they had only to last ten years. There was plenty of iron-work in connection with existing retorts which they hoped would last quite as long as this.

Mr. W. S. Smart (Saltley) remarked that, with regard to density, Mr. Comely said: "The crushing weight of an ordinary fire-brick is from 600 to 1000 lbs.; but some of the best brands would

stand 3000 lbs." Was this per square inch, or simply from 600 to 3000 lbs. on the brick itself? Jointing material had not been dealt with in the paper. He supposed the author assumed that the members were aware of the necessity of using jointing material of somewhat similar composition to the bricks themselves; but perhaps it was a point that might be emphasized by Mr. Comely in his reply. In regard to the standardization of retorts, this, as several speakers had remarked, seemed a difficult thing to bring to the front. However, he found in the "JOURNAL OF GAS LIGHTING" an article some three years ago, according to which the aims and objects enumerated by Mr. Comely could be attained in a different manner—that was, by making their retorts and fire-bricks for themselves at the gas-works. A full description was given of a plant which a London Gas Company laid down for making their own materials; and so successful had this been that they contemplated in the future making their own retorts. It was stated that they used 70 per cent. of their old fire-brick material ground up, and only 30 per cent. of new clay which they bought from the makers. This, however, was very different from the proportion Mr. Comely said the manufacturers were in the habit of using—that was to say, only one-third or one-fourth of old material. It seemed from the article that very little capital and very little ability were needed. It was said to be a means of finding employment for retort-house men in the summer months; and if this could be realized in practice, it seemed that some of the larger gas undertakings should follow the example of the Company referred to.

The PRESIDENT said he had one or two observations to make. He was quite in agreement with Mr. Bywater regarding the troubles arising from rule-of-thumb practices controlling such an industry as the one under discussion, especially as the Old Mine seam, upon which the reputation of the Stourbridge brick was built, was to a large extent worked out. The new clays were milder than the old; and "tempering" by the introduction of extraneous matters—*e.g.*, silica sand or highly siliceous clays—was not always practised with success, because the subsequent properties of the brick were so intimately connected with the chemical complexity and physical condition of its constituents, conditions which could not be determined or imitated at ease. The need of weathering for a sufficiently long time had been rightly insisted on, because when one considered that many of the natural silicates from which the "clays" had been developed were with difficulty attacked by strong mineral acids, the necessity of long-continued action of the atmospheric CO_2 and moisture, comparatively weak reagents, by which the more or less complete disintegration and elimination of alkalies was attained, was very evident. Respecting the fusibility of clays and bricks, as already mentioned, much depended on the physical and chemical state of the components; and this was well illustrated by the natural silicate leucite, which had an alkali constituent of 21·5 per cent. K_2O. This was infusible; but a mechanical mixture of the same composition was easily fusible. Then, again, manufacturers often said that there really was little or no research work being done, and what was being carried out was useless, because it might not give exactly the information required. For instance, there was an immense difficulty in distinguishing between the various classes of these silicates. Judged from their composition, some of them would be thrown out and others retained; but often those thrown out, on this basis, were better than those retained. Therefore the chemical side was rather in the dark. There had been work done; but more was required. With regard to the firing-test, in the firing of goods in a small furnace, the conditions were altogether different from those existing in an ordinary setting—that was to say, with reference to the action of the gases, &c. If they were burning coke, they had sulphurous gases and iron dust, and suchlike, going into the settings, and being deposited on the bricks and causing fusion. Therefore they might get in a small test-furnace a brick that would stand perfectly well, but which when placed in an ordinary setting would not. Therefore it seemed to him that by placing a brick in the combustion chamber and raising it to a high temperature, one did better than by having a small furnace. Mr. Comely seemed to infer that silica brick was not troubled by the flue ashes (the most important constituent of which was iron) and the action of gases. But he (the President) could assure him that silica bricks were very sensitive to the action of iron. For instance, taking a Stourbridge brick that was rich in iron, and putting it on the top of the combustion chamber, he had found frequently that the silica had fused right away where it had been in contact with the ordinary Stourbridge brick. He thought at first this was due to the binding material of which the joint was made; but he discovered in one case that there was no joint, the bricks having been merely placed end on end with nothing at all between them. The silica had run down like a piece of glass—it was not transparent, but was going on that way—so that he did not agree that silica brick was unaffected by iron to the extent that Mr. Comely said was the case. Of course, weathering was very important; and this could not be carried on too long. The more frost, too, they could get on the bricks the better, because it broke the material; and they all knew that, the finer the material, the more energetic was the action of reagents upon it. Mr. Comely said that his personal experience of Ewell bricks had not been very satisfactory. Most gas managers seemed to have been unfortunate in this respect in the Midlands; but in the South, when he was there, everyone swore by Ewell brick. It was soft; but the settings built of it had been very satisfactory indeed. One of its characteristics was that the longer it burnt the harder it became. It seemed to be a brick that could never be used up. If one got a good Ewell brick, one could not hurt it with any temperature that was encountered in gas manufacture. But some bad results had been obtained owing to some of the material having been improperly washed. There was a clay which should be taken out of the material; and on this occasion some plums of it were left in. His experience of Ewell bricks had been extensive; and everyone he had come across in the South had also spoken very highly of them, with the exception of the few truck-loads of which he had spoken. He had seen settings pulled out in which not only was the combustion arch and all the combustion chamber built of Ewell brick, but the producer was lined with it above the clinkering zone; and it was found to have lasted exceedingly well. The liability to flux was not great with Ewell bricks; they had had very little trouble from this. After all there was something to be said for a standard section of retort, if gas managers in general could be brought to it; but everybody had his fancies, and a man naturally thought more of his own ideas than of other people's. There was one point he would like to mention with regard to the melting-points of alumina and silica. It seemed very strange that these two materials when mixed together became more fusible than either was when apart. The lowest point was where one had 1 molecule of alumina to about 17 molecules of silica. Thus it did not follow that, because two substances had a very high melting-point, when they were put together one was going to get a melting-point intermediate between the two. He concluded by proposing that a hearty vote of thanks should be accorded to Mr. Comely for his paper; and in doing so, he associated himself with the remarks as to the great value of the paper which had been made by previous speakers.

Mr. J. H. WILLOUGHBY (Leamington), in seconding the vote, referred to the question of standardization, and said he believed that certain makers at the present time recognized certain sizes and shapes of retorts as standards, and manufactured in advance; otherwise they would not always be able to meet demands made upon them. As to refractory materials, there was no getting away from the fact that in a modern regenerative furnace there was a large amount of heat concentrated on a small space; and it was always necessary to get the best material possible to line that space. He differed from Mr. Comely with regard to Ewell bricks; for at his works they had obtained their best results from them. They had tried ganister and other similar bricks; and their arches had generally gone. At the present time they had Ewell arches which had worked 900 or 1000 days, and were still in use. His experience had been the same as that of the President—that the longer they burnt the harder they became. With reference to heats, he was of the opinion that the gas manager of to-day was apt to neglect taking his temperatures as he ought to do. He trusted to his own eyesight too much. One could not say exactly what the temperature was unless there was a system adopted of taking it. Pyrometers were rather difficult to manage at the back of a retort; but with the aid of Watson's heat recorders they had ascertained the temperature at his works, and found it was higher than they had thought.

Mr. COMELY, in reply, said it would need a paper twice as long as the one he had given to deal with the discussion properly. As to settings made entirely of Dinas material, he was largely quoting from authority, as he had not had much personal experience. Dr. Leisse, the Chemist of the Cologne Gas-Works, said he constructed a trial setting of Dinas material, and obtained such good results that in the following year ten beds of seven and two of nine retorts were built with these bricks.

Mr. BYWATER said he did not dispute that they would stand. His point was that with firing up and letting down they might crack in places that could not be reached.

Mr. COMELY (continuing) remarked that he had stated that when bricks and blocks were of great thickness they required longer to dry. As to Ewell bricks, he could give some results of experience. One firm of contractors, out of five cases in which they used Ewell bricks, had three in which they failed absolutely. In one instance, in some settings erected by another firm of contractors, the Ewell bricks had failed before the retorts were hot. The makers said that when once the bricks had vitrified they would stand. He quite agreed with this; and many people had been fortunate enough to obtain good Ewell bricks. But he did not think any gas manager could afford to run the risk of three settings out of five failing. In Birmingham, also, he believed the experience had been unfavourable. The analyses were taken under different conditions. In one case it was a dry sample, and in the others a piece of raw clay. The analyses of raw clay were recent ones—taken five or six weeks ago.

Mr. JONES: It seems a pity to put them together, as though they are comparable.

Mr. COMELY said he meant to ment ion that the Glenboig was a dry sample. After all was said and done, if a chemical and physical analysis had been made, with their present knowledge of the subject he still thought they needed the fire test to come to a final decision, because the whole question was so complex that until they knew very much more about the composition of refractory substances it was difficult, and in most cases dangerous, to speak definitely at all. With regard to the small furnace for testing samples, he should quite agree that a test in a retort-setting was preferable, and would suggest that the two would be better still. In conclusion, he thanked them all very much for the extremely kind manner in which they had received his paper.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District Visit Glenboig Fire-Clay Works.

The members of the Eastern District of the Scottish Junior Gas Association, to the number of nearly thirty, paid a visit on Saturday to the works of the Glenboig Fire-Clay Company, Limited. The main body travelled from Edinburgh, and on arrival were received by Mr. John Douglas, one of the principal officials of the Company. Small parties were made up, and were conducted through the Star and the Old Works by Mr. Douglas, Mr. George Johnston, Mr. John Baird, Mr. Robert Reid, Mr. William Baird, Mr. D. M'Mahon, and Mr. R. Blackwood.

There is a pit in the Old Works, 20 fathoms deep; and clay is brought to the works in hutches from three other fields, all then being mixed together. But before anything is done, the clay is subjected to a process of weathering. It is then fed into an ordinary stone-breaker, and passes to the mill, in which it is ground in a dry state. It is next elevated, carried by a conveyor, and deposited at will into any one of a series of hoppers, from which the pan mills, where it is moistened and made ready for moulding, are supplied. From these it is filled into hutches, which are elevated and run along the upper flat to the points where it is delivered to the moulding benches. Almost all the moulding is handwork. The floor of the lower flat is of concrete, under which there is a very close network of small passages, in which live steam is circulated, to provide heat for drying the moulded pieces. The steam supply can be regulated so that pieces of the size of an ordinary fire-brick can be dried in one day. Larger pieces require to be dried more slowly; and these are placed on the upper floor, the heat in which is only that which rises from the flat below. Pieces were seen of cube form, with 24-inch sides, which take weeks to dry. There are numerous kilns, and of various constructions, fired by coal direct and by producer gas. In the latter (the invention of Mr. James Dunnachie, the Managing-Director) the air which is to be used for admixture with the gas, for the heating of the kiln which is being fired at the time, is drawn through those which have been already fired and are cooling down—advantage being thus taken of heat which would be otherwise lost. Again, before a kiln is put under the fierce heat of the firing process, the one which is to be taken next has been filled; and the tail of the flame from the one which is being fired is played into it, by which much of the first, or slow, stage of firing is accomplished by heat which would otherwise pass up the chimney.

The produce of the works is fully 100,000 bricks a day, besides other pieces, among which are, in the Old Works, the making of gas-retorts. Of these, over 5000 are produced annually. The making of one was shown in operation; the retort under construction being, by coincidence, part of a contract for the Granton Gas-Works. In a store were shown the numerous templates for the varied forms and sizes of retorts favoured by individual gas managers. It seemed almost incredible; but the assurance was given that there are over 500 different shapes and sizes of retorts in use in the gas-works supplied from Glenboig. The retorts are necessarily dried where they are built, and are then conveyed—a work of much care—by overhead crane into the special kilns in which they are fired, standing on end.

In the Old Works there is a small gas-works, in which oil gas is made for the illumination of the workshops. These works have been in use for over twenty years, and are not regarded as in any way up to date; but they have the peculiar feature that the oil is carbonized in fire-clay retorts made in the works. These are circular, about 3 feet in length and 10 inches in diameter, with walls 3 inches thick. The residuum left in the retorts is a sort of hard tarry coke, which is valueless. Before leaving the works, the visitors were taken to see an Institute, which the Directors have erected at a cost of about £3000, for the benefit of their workers.

The inspection over, the company were entertained to coffee and other refreshments in the offices, which are housed in a building constructed of the Company's bricks, and of handsome appearance. Mr. Douglas said he was sorry the Managing-Director and Chairman, Mr. Dunnachie, had not been able to be present, having been detained in London. Speaking of the visit, he remarked that he would just like to hint to such of them as might be ordering retorts, in years to come, that, while it was not the business of the Company to dictate to them, he supposed they would have seen that the Company had a large plant, for which, during a part of the year, there was not much doing; and it would be greatly to the advantage of all if this plant could be kept going at a sort of normal rate all the year round. They could thus see the importance of ordering retorts early. He proposed the toast of "Prosperity to the Scottish Junior Gas Association," coupled with the name of Mr. W. Brown, of Lasswade, the President of the Eastern District. This was acknowledged by Mr. Brown, who then asked those present to drink "Prosperity to the Glenboig Union Fire-Clay Company." At the same time he would propose a hearty vote of thanks to Mr. Douglas and the other gentlemen who had placed their services at their disposal that afternoon; and he would ask Mr. Douglas to convey to Mr. Dunnachie, and to the Directors, the thanks of the Association for the provision they had made for them that day. Subsequently Mr. G. Johnston, speaking as the oldest official in the place, said he had much pleasure in welcoming the Association to Glenboig.

GAS-ENGINES FOR MARINE PROPULSION.

At the Meeting of the Manchester Association of Engineers on the 26th ult., a paper on the above subject, considered in its relation to Imperial commerce and defence, was read by Mr. A. Vennell Coster, who is associated with Messrs. Crossley Bros., Limited. The following is an epitome of the paper, which dealt fully with the question, and was illustrated by a large number of diagrams.

The author began by pointing out that marine propulsion by gas is rapidly coming to the front—many leading engineers devoting their attention to it. He therefore thought it would not be out of place for Manchester, which is now one of the largest ports in the United Kingdom, to take up the consideration of the subject. Having reviewed the relative merits of gas reciprocating engines, steam-turbines, and steam reciprocating engines for marine purposes, Mr. Coster said it might be safely assumed, as a rough commercial comparison on the basis of the figures he had submitted, that a gas-engine would turn into actual work about twice as much of the total heat in the coal as the best reciprocating engine or steam-turbine. The fuel consumption with steam plants was from 1·3 lbs. to 1·6 lbs., and with gas plants from 0·65 lb. to 0·8 lb., per I.H.P.; so that either the bunker room might be reduced 50 per cent. or the vessel's radius of action increased 100 per cent. in favour of marine gas propulsion. He claimed the following six advantages for a gas installation: (1) The ship driven with one-half the amount of fuel. (2) Stand-by losses reduced by over 75 per cent. (3) Working pressure confined to the engine cylinders. (4) No boiler-tubes or main steam-pipes to burst, or furnace crowns to collapse. (5) No priming in a heavy seaway, or water-hammer in pipes and cylinders. (6) No more difficulties with the firing of boilers in a beam sea. Gas-producers might, he said, be charged only twice every 24 hours; and the rolling and pitching of the vessel was rather an advantage than otherwise in assisting the fuel down from the charging-hoppers.

Having enumerated the advantages of gas propulsion, the author proceeded to consider the dangers attending it, and the difficulties inherent in the gas-engine. He acknowledged that there are still many difficulties to be faced; but he looked with confidence to their being overcome. The object of his paper was, he said, to put before the members such a scheme of marine propulsion that the most cautious would be willing to risk a voyage by its means. The main difficulties were: (1) The construction of a gas-producer capable of gasifying all grades of bituminous coal. (2) A simple method of cleansing the gas from tar, before the introduction of the fuel into the producer proper, when in the producer, or after the gas had left it on its way to the engine. (3) Perfect control of the gas-propelled vessel in starting, stopping, reversing, and running at all speeds. Dealing with the first and second difficulties, Mr. Coster pointed out that if anthracite coal or coke were used, these would be entirely avoided; but with a limited supply of the former, the wisest course was to leave it altogether out of the question. For marine purposes, they must deal with ordinary bituminous coal, which was cheap compared with either anthracite or coke, and was the only possible fuel for marine gas-producers. Its thermal value varied from 10,000 to 14,000 B.Th.U. per pound; and it cost from 6s. to 7s. per ton. For many years gas-engines had been driven by bituminous coal gas; and the difficulty had always been to get rid of the condensable hydrocarbons, which would fill and clog the valves and gas-passages of any engine they were allowed to enter. This problem was one that must be faced rather by chemists than by engineers; and many notable firms had already solved the problem, but not in the simple manner that would make the gas plant perfectly suitable for marine purposes. It was reported, however, from several trustworthy sources that a simple solution had been discovered. Passing to the third difficulty—that of controlling perfectly a gas-propelled vessel—the author considered in detail all the points bearing upon it.

On the subject of the type of gas-engine to be adopted for marine purposes, Mr. Coster said the simplest was the best; and there was none so simple and so satisfactory as the four-cycle or "Otto" type, with its sequence of suction, compression, power, and exhaust strokes taking place in each cylinder. This type of engine, with inverted vertical cylinders, had a mechanical efficiency of more than 90 per cent., and a thermal efficiency of 33 per cent.; and for a vessel requiring (say) 3000 H.P., units of six single-acting cylinders, with pistons of 21 inches diameter and 24-inch stroke, without piston-rods, stuffing-boxes, or piston water-service, would be suitable. But where larger powers were required, tandem cylinder engines with open cylinder liners, having piston-rod and stuffing-box between the tandem cylinders, where they could be easily inspected and adjusted, would be better. The greatest of all difficulties, however, in the application of gas-engines for marine purposes was the attainment of a sufficient range of mean effective pressures in the cylinders, so that varying speeds could be run without fear of stopping. A solution of the problem had been proposed in a gas-engine built on the Diesel lines; but difficulties attended it. The author had, he believed, arrived at a solution which overcame them all by a practical manipulation of the speeds of independent engine units. By running some of them ahead and some of them astern, any speed

in either direction could be readily attained by the officer in charge of the vessel on the bridge, and without stopping, except during reversal, a single engine, or the normal flow of gas through the producers.

Mr. Coster next went on to review what has been done in the way of propelling vessels by gas power; starting with the *Emil Capitaine*—the first boat fitted for gas—and enumerating the subsequent vessels and their capabilities. He gave some figures, supplied to him by Mr. H. Cherry, of Newcastle, showing the economy of gas plant as compared with steam plant, each of 1400 I.H.P., on 200 days' steaming. In the case of gas, the cost of fuel was £1350; in that of steam, £3375—a difference of £2025; and the weight of the gas plant was only 267 tons, against 373 tons in the other case. Another interesting comparison was made with the *Lord Antrim*, a steamer which the author showed fitted with gas producers and engines; the latter developing the same horse power as the steam-engines, but running at the increased speed of 150 revolutions per minute. Having given some explanatory details of this installation, he concluded by saying that he submitted marine gas propulsion as an alternative to steam propulsion with the greater confidence because gas plants required no funnels and did not emit smoke. There was no serious difficulty in fitting up battleships having from 20,000 to 50,000 I.H.P., seeing that the total plant would have less weight and occupy less space than steam plant of the same power. He emphasized the point that the Navy must be kept up-to-date, and urged the advantages of gas propulsion as a valuable step in the direction of efficiency.

OVOIDAL-MOTION VALVE FOR DRY GAS-METERS

At a Meeting of the Royal Scottish Society of Arts in Edinburgh on Monday last week, Mr. Henry O'Connor, F.R.S.E., submitted a communication prepared by himself and Mr. W. Alexander, in which was described the above-named valve.

In the course of the communication, it was stated that, under very extreme circumstances, such as the breaking of the outlet connections and a high inlet pressure of gas, a dry gas-meter may register more or less than the allowed range when passing considerably more than its nominal quantity, though under ordinary working conditions the meter is quite correct. But with the ovoidal-motion single-valve meter, the rate of working might be varied from 0·5 cubic foot per hour at ½-inch pressure, to an open outlet at 3-inch pressure, when a 3-light meter will be passing 180 cubic feet per hour, or ten times the quantity which the meter is made to pass and register, while the registration will never vary to a greater extent than is permitted according to the Act. Tests of an ordinary two-valve dry gas-meter showed uneven deliveries, owing to the short connecting-rods needed to keep the valves within the compass of the meter case, and also because the valves had to be set at right angles, to avoid the use of a double-throw crank. This position of the valves called for somewhat elaborate passages from the valve-ports to the four chambers into which a dry meter is divided.

In an ordinary dry meter, the gas changes its direction a very large number of times between the inlet and the outlet—in all, an average of 12 per revolution of the meter. It commences in a downward direction with a dead-end, passes horizontally through a side hole in a plate to another dead-end, then upwards through a side hole in a plate to a chamber where the flow is reduced in speed but is horizontal, then downward through the valve, either direct to the case or horizontally along the apron and vertically downward through the tongue into the bellows. After the filling of the case or bellows, the flow is reversed, and passes upwards through the valve from the case, or upwards through the tongue and horizontally through the apron, then upwards through the valve, horizontally under the valve, comes down through the outlet-port of the valve, thence horizontally through the breeks, and finally vertically upward through the outlet-tube. This change of direction is made either 10 or 14 times, or an average of 12 times, during the passage through the meter. When the very small amount of initial pressure available for working the meter is taken into consideration—amounting to only 1·828th lb. per square inch, or say 0·0012 lb. when testing at the usual ½-inch pressure—it will be seen that these various changes of direction must seriously hamper the working of the meter. In the ovoidal valve arrangement, the gas passes down the inlet-pipe to the chamber through a larger hole, then horizontally, and downward through the valve to the case or through the tongue to the bellows—the tongue being so shaped as to cause a gradual and slight change of direction only through the division into the bellows. Returning, after filling the case or bellows, the gas flows upwards through the tongue and ports of the valve horizontally at slower speed under the valve-cover, then down and horizontally through the outlet-port and away to the outlet-tube, where it passes out vertically, or in all only eight changes of direction. This must partly account for the extra quantity of gas passed through the latter type of meter.

The first idea of the second author of the paper was to use a four-port valve and later on a five-port one. Some difficulty was, however, found to get the cycle correct with the latter. After trying all the four ways of connecting up the ports direct to the bellows and the case, it occurred to the first author to connect up two of the ports to the bellows on the opposite side of the division plate; and this proved to be the solution of the difficulty. Now the port farthest from the crank at the hinder side of the meter is connected to a tongue which passes down through the rim of the back bellows, so far like the usual tongue; but this tongue is continued down so as to completely cover a hole in the division-plate through which the gas passes to and from the front bellows—a similar tongue attached to the front port serving in the same way to connect up to the back bellows.

Circular motion or rotary valve meters have been made in the past, in which the cover and grid were over one another—the cover being rotated about the centre of the latter. This gave uneven wear, as the parts near the periphery were subjected to a longer travel than those near the centre. This uneven wear is avoided in the ovoidal valve, as each part in it has practically the same amount of rubbing, and this rubbing is of the same nature and has the same travel as is used by the man in grinding and preparing the valves and covers when making an ordinary meter. This particular motion has been adopted by the grinder as it has been found that it brings up a true and even surface more quickly than any other. Surely, then, this is a movement in the right direction, to make the valve travel in such a way as will tend to wear it evenly, and thereby keep the faces true. If the valves leak, gas passes through the meter without being registered.

It is a well-known fact that the passage of the gas through the narrow spaces between the valves and covers, causes a deposit of some of the hydrocarbons from the gas upon the surfaces of the valves, and this speedily changes to a glutty substance, which at times becomes so hard as to absolutely prevent the movement of the valves. The direct reciprocating movement of the ordinary valve does not appear to have any clearing effect upon this glut; but the angular motion of the edges of the ovoidal valve seem to clear away the deposit as soon as it appears. Experiments made with such glut have proved that the meter works more easily with the newer type of valve. [Mr. O'Connor exhibited a quantity of glutty matter taken from a dry meter which had been only three months in use.]

In conclusion, the authors said a strong point in favour of this form of meter was the ease with which it could be repaired, even when rusted through in such vital parts as the valve-plate or the breeks. In the usual way, such meters were condemned, as the cost of repair was practically the same as that of a new meter; but with this construction, the elaborate passages being dispensed with, such a repair was quite possible at a price which would make it an economical transaction. This type of meter had been tested by the manager of the meter department of one of the largest corporation gas-works in the kingdom, and he reported that the results obtained were excellent. He said: "The meter was tested at 5-10ths of an inch pressure, and from that up to 3 or 4 inches. Again, we passed ½ cubic foot per hour, and then 30 feet per hour through the meter against the holders. We tried shifting the centres on the valve-seats. Your meter withstood all our attempts and efforts to find defects. I really think you have hit the mark this time."

Discussion.

Mr. Proctor spoke of the importance of having something in the way of accurate measurement of gas; and he thought, as Mr. O'Connor referred to the sharp angles in meters, that there must be an immense amount of loss in the volume of gas measured. The meter which Mr. O'Connor had described would, he considered, be a distinct improvement on existing meters. He was astonished at the amount of glut which could be collected in a dry meter.

Mr. Ritchie said there could be no doubt that a gas-meter was a most delicate instrument. Mr. O'Connor had shown them a deposit which had been produced by gas passing through a meter; and if this deposit took place in three months, what would be the condition of a meter which had been in use for (say) ten years, and was still going on measuring gas? He thought there should be a periodical inspection of gas-meters. Mr. O'Connor's invention was an ingenious one. There could be no doubt that a slide-valve moving in a perfectly straight line would cause wear and tear; whereas a valve with an elliptic motion would not.

Mr. J. Davie said the idea involved in this single-valve meter was one upon which he would not care to express an opinion without studying the paper further; but anyone accustomed to gas-meters must welcome anything in the way of a meter which was likely to be a more accurate means of measuring gas. It was a great astonishment to him to see such a collection of stuff taken from a meter which had only been three months in use. Evidently the makers had been determined to oil it well. He did not think the deposit came from the gas they were accustomed to in Edinburgh.

Mr. Reedie knew that there was a good deal of unnecessary suspicion thrown upon the action and registration of dry meters. So far as cleanliness was concerned, he had seen a 50-light dry meter which had been in use for 25 years as clean and in as good order as when it was new. He had had in his hands that day a 2-light dry meter which had been in constant use for 30 years. It was pretty well worn down, but it did not seem to have very much wrong with it, in the inside. The people had perfect confidence in it. The deposit that took place depended chiefly on the quality of the gas. He thought meter makers had a grievance in being required to guarantee meters for five years.

Mr. W. A. Carter sympathized a good deal with what Mr. Davie had said, that they could scarcely enter into an intelligent discussion upon a delicate instrument such as the one before

them unless they had previous knowledge of its mechanism. Mr. O'Connor claimed that his meter produced an equality of action in the way of pressure and supply, and that it presented facility for repair which the two-valve meter did not. The question of equality of pressure and supply was one that had a very large effect upon the present method of gas lighting. The incandescent burner appeared to be peculiarly sensitive to differences in pressure; and if any new meter should be brought into the market which would improve the pressure, and make it more equal, it would be hailed by the public, and would be of great advantage.

Mr. O'Connor, in reply, said he thought they had to consider how they could reduce every cause of friction in a meter, and so make it work as easily and smoothly as possible. With regard to the question of oil, an American recently suggested that the best possible arrangement for a dry meter was to put a pint of mineral oil into it, which would keep the leathers moist. He thought this was quite unnecessary. He had seen a meter which had been in use regularly for 45 years, and which was stamped a few days previously as being a correct measurer at the present time. It had not been opened, as it had not been necessary to touch it. The gas used in the meter to which he had referred did not come from the Edinburgh Gas-Works. The places where deposits were found were probably those where the gas was not properly cleaned and condensed. He was quite in favour of the frequent testing of meters—say, once in five years.

A hearty vote of thanks was accorded to Mr. O'Connor, and the paper was sent to a Committee to be reported upon.

SOME VIEWS FROM AN INCANDESCENT MANTLE FACTORY.

Some idea of the enormous extent of the incandescent gas-mantle business at the present time may be gathered from the fact that the United Chemical Works, Limited—one of the largest establishments of the kind in the world—employ during the season more than 1000 hands, and are able to turn out 200,000 mantles a day. Reckoning 300 working days a year, this would represent an annual production of no less than 60,000,000 mantles. These are, of course, despatched to every part of the world where artificial light is used; the collodionizing of the mantles being so well carried out that it is possible to transport them without damage to such places as South America, Java, Cape Town, New York, and Iceland. The United Chemical Works, it may be remarked, have come into existence by the amalgamation of seven factories, each of which, it is claimed, was already one of the best in this particular trade.

In the "Journal" for Jan. 26, 1904 (p. 209), there was published a very full illustrated description of the new mantle factory in Berlin of the United Chemical Works; and we are to-day giving some further views showing the burning-off arrangements for the different mantles manufactured by the firm—the apparatus employed in which process is protected by a large number of patents. These illustrations do not need any explanation at our hands; for the process of burning-off is by this time as familiar to those interested in the gas industry as is the name by which this particular Company's mantles are known—the "Ino." One of the claims put forward on behalf of these mantles is that only the very best ramie silk is used in the manufacture of the stockings; the strength and the special qualities of the yarn used being the outcome of many years' study. In the chemical washing of the fabrics—which is one of the most important stages in the manufacture of the mantles—the Company make use of a secret process which is known only to a very few trusted persons; while the impregnation of the stockings is also carried out by a method which is kept a strict secret, and which has been devised with the object of bestowing on the mantles the highest illuminating power and the greatest durability attainable.



Burning-Off Room for "C" Mantles.



Burning-Off Machines.



Burning-Off Inverted Mantles.

An Excellent Catalogue.

Quite a sumptuous volume has been produced by the Richmond Gas Stove and Meter Company, Limited, which not only constitutes a complete survey of the Company's extensive range of manufactures, but it is, in truth, a pictorial representation of the great range of the uses of gas for purposes other than lighting in the household, large business establishment, or public institution, and in the smaller of industrial occupations. The book is both interesting and instructive. It impresses upon one how magnificently things have grown in connection with coal gas utilization; and the growth has not yet ceased. The volume contains nine sections; and as there are 250 pages in it, it will be seen that numerous pages are required for each section. The first division comprises gas-cookers of all kinds—the best grades, slot, and Colonial, hot-plates, grillers, boiling burners, smoothing-iron heaters, trade stoves, and crucible furnaces. In the second section are to be found special large cooking apparatus. The third section carries the attention to gas-fires, white-light stoves, &c.; and the fourth, to various kinds of radiators. Fittings and utensils of all kinds find place in the fifth section; and in the sixth are pictured and described ordinary heaters and boilers and greenhouse heaters. The seventh and eighth sections are devoted to dry and wet meters, station meters, main cocks, &c.; and in the ninth section are announcements which the firm's customers will find very useful. The volume is prepared in a style that must gain admiration. It is printed on art paper and well bound. The typographical and illustration work is excellent. The printing is in two colours; but there are also coloured illustrations that have required several printings—one of them as many as fourteen. The very character of the volume will bespeak preservation; for no one would dream of consigning such a meritorious production to the waste-paper basket. There is a special index given to each section; and copies of sections separately have also been prepared for the convenience of those who may need them for future reference.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Jan. 29.

(*Before Mr. Justice* PARKER.)

In re the Kent County Gaslight and Coke Company, Limited.

This was a petition by J. R. Carmona and others in connection with the above-named Company for a compulsory winding-up order.

Mr. WHINNEY, who appeared for the Company, said he had to ask that the petition might stand over. The Company had filed their evidence as long ago as the 10th of January; and though the Registrar made an order limiting the petitioners to ten days in which to file their evidence, he had only just received an affidavit, and had not had an opportunity of looking at it.

Mr. EUSTACE SMITH, for the petitioners, thought he could not reasonably oppose an adjournment for a week.

His LORDSHIP assented, and suggested that the evidence might be excluded as being out of time.

Mr. SMITH said the affidavit merely exhibited a newspaper report.

Mr. WHINNEY said he should submit that the evidence only of the statutory affidavit in support of a petition was not, under the rules, sufficient where charges of fraud were alleged against directors.

His LORDSHIP said it was also alleged that practically there was no substratum of a Company left.

Mr. WHINNEY replied that this could not be truly said, because the Company were continuing to supply gas to the district.

Mr. JESSEL, K.C. (who appeared with Mr. EUSTACE SMITH), asked for leave to supplement their evidence, if necessary, charging fraud against the Directors.

His LORDSHIP gave leave; and the petition was adjourned for a week.

EMBEZZLEMENT CHARGE AGAINST A GAS MANAGER.

At the Watford Petty Sessions, last Tuesday, Mr. Henry Hill, late Manager of the Rickmansworth Gas-Works, was charged with embezzling 10s. on Oct. 8, 1906, 10s. on Oct. 24, and £2 15s. on or about Sept. 29—these being sums received by him on account of the Urban District Council.

Mr. J. H. Murphy, who prosecuted, stated that the case was one of some gravity; and it was alleged against defendant that he had been guilty of systematic fraud. The charges were of embezzlement, falsification of accounts, and larceny under the Larceny Act of 1901. Defendant became a servant of the Council on the transfer of the gas-works from the Company to the Council, at a salary of £3 10s. a week. The Council gave directions as to how he should collect the money from the slot-meters, and insisted that he should bank the takings on the morning of the day following. The Council were not satisfied with the defendant's conduct; and on Dec. 7 they dismissed him, on the ground of misconduct and incompetence. Defendant was pressed to hand over his books and papers, but without effect. On Dec. 14, defendant—as an act of amazing impudence—instructed a firm of solicitors to apply for £2000 damages for wrongful dismissal. The next step was that a London firm of solicitors said they had received instructions to serve a writ for the £2000. The matter came before the Council; and they directed the Clerk to accept service of the writ. This had been done; and there the matter stood. Investigations were then made of the accounts, and it was found that in numbers of cases defendant had been to customers and abstracted cash from the meters, stating that he was in urgent need of money to pay the workmen. This was an absolute fabrication, as the men were paid every Friday. That was one class of offence. In another instance, defendant gave to a man named Wright a receipt for £2 2s.; but the counterfoil, which was in defendant's own handwriting, only showed £1 12s. The entry in the cash-book by defendant only showed a payment of £1 12s. by Wright. The index-book, showing the amount of gas consumed by Wright, gave evidence of manipulation. It was altered to agree with the amount paid in by defendant. Then there was the case of a Mrs. Webb, at Croxley Green. A man named Welch collected money from her slot-meter, and gave a receipt for £1 3s. There was no counterfoil for this amount. The entry in the index-book was no consumption of gas by Mrs. Webb; and therefore there was no payment. In October, defendant himself collected the slot money, and gave Mrs. Webb a receipt for £1 17s. The counterfoil, which should be a facsimile of the receipt, showed only £1 7s.; having on the face of it obvious evidence of having been tampered with. Defendant's entry in the cash-book, too, was only £1 7s. The index-book showed evidence of having been altered. Another case was that of a Miss Willis. On the Saturday after the Michaelmas quarter, defendant called on Miss Willis, opened the meter, and took out what money there was in it, gave no receipt, and walked off. When the meter was examined in January, it was 9s. short; but there was no evidence in the cash-book by defendant that he had received this 9s. In the case of a man named Copping, Welch collected the money and gave a receipt for £1 17s.; and the counterfoil showed only 17s. The counterfoil originally showed £1 17s.; but he suggested that the £1 had been erased, leaving only the entry of 17s. On another occasion £2 15s. was collected from Mr. Copping. A receipt was promised, but was never sent. Defendant entered in his books the receipt of £1 11s. from Mr. Copping. In the case of a man named Hounsfield, Welch collected the money for the June quarter, and gave a receipt for £1 5s. There was no counterfoil in respect of this amount; but in the place in the book where the counterfoil should be, there appeared another name in defendant's handwriting. Looking at it, one could see that the name of Hounsfield had been scratched out and another name written over it. These were specimens of the various classes of cases on which he should ask the Bench to commit defendant for trial.

A large amount of evidence was then called to bear out the opening statement of Counsel; and at its conclusion, the further hearing of the case was adjourned until yesterday (Monday), when defendant pleaded "Guilty," and was sentenced to six months imprisonment in the second division.

Dispute Over a Gas-Meter.

In the Oldham County Court a few days ago, the Corporation Gas Department sued Harry Rodgers for £2 0s. 6d. on account of the exchange of a gas-meter. It was stated by the Deputy Town Clerk (Mr. Garside) that on June 6 defendant telephoned to the Gas Department, and speaking to Mr. Massey, the Assistant-Manager, ordered his meter to be repaired, or, if necessary, exchanged. It was usual in these cases to confirm telephone orders by letter; but owing to Mr. Massey and the defendant being acquainted, the practice was not carried out in this instance. The meter was taken out in the ordinary course and despatched to a firm who repaired meters for the Corporation. This firm decided that the meter was not worth repairing, so the Corporation fixed a new one. For the defence, Mr. Marland called Mr. Rodgers, who contended that he only gave an order for the repair of the meter and not for its exchange. If the meter was found to be unfit, he should have been acquainted to this effect, and he would have got a second-hand one for a guinea. Mr. Marland also alluded to the fact that on June 12 last year, the Corporation Gas Committee passed a resolution, which was confirmed by the Council in July, that "the Corporation should take over and maintain in working order, at their own cost, all meters that had been in use for a period of not less than five years." Mr. Garside said this was passed subsequent to the order being given; but Mr. Marland replied that the meter was not fixed until July. His Honour Judge Bradbury said there was an unfortunate conflict of evidence. There was no confirmation of the order by letter; but a memorandum made at the time by Mr. Massey, which had been handed in, showed that the order was for repair, or, if necessary, an exchange of the meter. The defendant trusted to his memory, and stated that he did not remember asking for the exchange of the meter. He (the Judge), however, came to the conclusion that the order was given as stated by the Corporation; and if this was so, they were entitled to take the usual steps. A corporation were not expected to get second-hand meters. He accordingly gave judgment for the Corporation for £2 0s. 6d., and costs; at the same time remarking that it was unfortunate the case should have been disputed.

Power-Gas Corporation.

In their report for the twelve months to September last, the Directors of the Power-Gas Corporation state that the year's trading of Messrs. Ashmore, Benson, Pease, and Co., shows a profit of £1581, as compared with a loss of £1483. This result would have been considerably improved if the works could have been kept as busy during the whole of the financial year as they were during the first part of it. They are, however, at the present time well employed; and there appears to be a prospect of continued activity in the engineering trade. Messrs. Ashmore, Benson, Pease, and Co. are the only debenture holders and the principal shareholders in the "A.B.P." Accumulator Company, whose business formed a department of the Stockton works when they were originally taken over by the Corporation. It having been found impossible, in spite of prolonged efforts, to make this business a profitable one, it has now been decided to liquidate the concern voluntarily, so as to avoid further losses. The Corporation have not received the benefit of any income, either from their advance to, or shareholding in, Messrs. Ashmore, Benson, Pease, and Co. The Directors have to report that several important producer-gas installations have been satisfactorily completed and started work during the year. A number of such installations are in course of construction and erection; and negotiations are pending for further business, some of which it is hoped will soon be concluded. The balance-sheet shows a balance to the credit of profit and loss account of £5482, which the Directors propose to apply as follows: To be written off preliminary expenses account £2300, and to be carried forward, £3182. The Auditors' report states that, "the property account of the Company appears in the balance-sheet at cost without depreciation. The investment in, and advances to, Messrs. Ashmore, Benson, Pease, and Co. are taken at cost without depreciation. That Company anticipate a loss, which is not provided for, on their investment in, and current account with, the 'A.B.P.' Accumulator Company, which is in liquidation. The investments in other Companies are taken at face-value; but for these the market price, where available, is considerably less than face-value. The estimate of profits on contracts partly executed, as in former years, has been made by officials of the Company."

Colne Water Supply.—At the meeting of the Colne Town Council last Wednesday, they decided to apply to the Local Government Board for sanction to borrow £2500 for the erection of filters, a meter, and the necessary building at the Laneshaw reservoir; also a further sum to cover the cost of laying additional and enlarged water-mains in various parts of the borough.

Market Deeping Water Supply.—At a meeting of the Market Deeping Parish Council last Thursday, a letter was read from the Bourne Rural District Council respecting the South Lincolnshire Water Bill; and it was resolved that, as the parish had an ample supply of water, the Council were of opinion that there was no necessity for the extension of the Water Company's undertaking so as to include it. The Council further considered that the Rural District Council would be the best authority for supplying water within the parish; and the Parish Council would support in every way in their power any action the Rural Council might take in opposing the Bill.

REGISTER OF PATENTS.

Treating Coal Gas to Extract Tar and Ammonia.

FELD, W., of Hönningen-on-Rhine, Germany.

No. 26,262; Dec. 16, 1905.

The patentee points out that, in general practice, tar has been separated from gases (illuminating gases, and gases from coke-ovens, producers, lignite coal stills, and analogous gases containing tar, water, and ammonia) by cooling the gases at a low temperature, so that the water in them is condensed at the same time as the tar; the cooling generally being carried on until the gases leave the coolers at about the temperature of the air—say, from 20° to 25° C.

It has been proposed to first separate the tar by cooling the gases down to a temperature of from 60° to 70° C. (so that less illuminants are absorbed by the tar), and then to condense the water, together with part of the ammonia of the gas, by further cooling. But this does not have the desired effect, as by cooling alone the tar, being suspended in the form of very fine liquid particles, cannot be completely separated from the gases. On the one hand, the tar separated is mixed with water and ammonia; and, on the other hand, the condensed water is mixed with the part of the tar left in the gases and absorbs a considerable portion of the volatile compounds of ammonia with carbonic acid, hydrocyanic acid, and sulphuretted hydrogen. From about one-half to two-thirds of the ammonia is thus absorbed from the gases by the condensed water; and this constitutes "virgin liquor," which is mixed with tarry matters, and is a very weak and impure ammonia liquor.

In order to obtain the remaining one-third or one-half of the ammonia from the gases, according to one method they have been first treated with virgin liquor and then with fresh water. The liquors were mixed with tarry matters and very impure, and gave weak ammonia liquors—these liquors, being weaker in proportion to the amount of fresh water, used to absorb the ammonia from the gases.

Thus in these old processes the ammonia is recovered in two different forms—both being impure and weak liquors, containing tarry matters, and the tar containing ammonia. The treatment of the impure and weak liquors necessitates dealing with large volumes (quite out of proportion to the value of the ammonia recovered); and this requires large distilling plant, "which, however, can only produce impure ammonia compounds containing tarry matters and other impurities, and giving objectionable waste gases and liquors." For this reason the recovery of ammonia from such gases is, in many cases, impracticable, especially if much water be contained in the coal distilled—as is the case, for instance, with the gases from lignite coal stills, such gases frequently containing as much as 50 per cent. of water. For the same reason the extraction of ammonia from coal gases containing ammonia and carbonic acid, by treating the gases with salt solutions, could not be effected; the salt solutions being too much diluted by the water condensed from the gases.

It has also been proposed to treat the gases in a centrifugal apparatus above 100° C., and then to absorb the ammonia from the hot gas by acids. But complete separation of the tar is not possible by this means; and part of it is condensed in the acid bath.

According to the present invention, the patentee proposes to first completely separate the tar from the gases at such a temperature that no ammonia is absorbed by the tar, and then to separate the water from the gases, without carrying away ammonia with this water.

This separation of tar and water is effected by special treatment of the gases, first with tar, already separated from the gases and before it leaves the washer, and then with water separated from the gases—the treatment being performed at a temperature above 40° C., as hereafter explained, and by passing the gases first through a spray of the tar and afterwards through a spray of the water. Having thus separated the tar and water from the gases, the gases still contain their original amount of ammonia; and this ammonia is then extracted from the gases by means of acids, or salt solutions, and the ammoniacal solutions are obtained undiluted by the water of the gases, and not mixed with tarry matters and other impurities. At a temperature above 40° C., most of the ammonia compounds present in the gases—such as the carbonate, cyanide, and sulphide—are volatile or decomposed, and only a small part of them can be formed and dissolved in the tar and in the water separated. The higher therefore above 40° C. the temperature of the gases is kept in separating the tar and water, the less will be the amount of ammonia absorbed by the tar and condensed water; and in the process according to this invention, it is possible, by the special treatment, to separate the tar at a temperature even as high as 500° C.

The invention—the specification of which is not illustrated—is carried out as follows: The gases first have the tar separated from them while they are at a temperature under 500° C.—say, between 100° and 200° C.—the tar at such temperature being separated from the gases in the form of drops, by being caused to pass through hot tar already separated and before it leaves the separator, and therefore before being cooled; the tar being dispersed in the form of fine spray across the space through which the gases under treatment pass, so as to cause the tar, suspended in the gases in the form of a mixture of soot and liquid tar-oils, to be formed into drops, in order that the whole, or practically the whole, of the tar is separated from the gases without water being condensed. To remove the last traces of tarry matters from the gases, they may be treated in a second apparatus at or about the same temperature as before (under 500° and preferably between 100° and 200° C.) with tar-oil or thin tar already separated from the gases employed as a spray through which the gases pass, as described with regard to the first separation of tar. If the temperature of the gases passing the tar-washer be lower than 100° C., some water will be condensed; but this will not absorb much ammonia, provided that the temperature be kept above 40° C.; and such water separated from the tar can be used in the next apparatus to separate the rest of the water of distillation as hereafter described with regard to the water condensed in the cooling apparatus.

The gases thus freed from tar, and being in a warm and moist condition, enter the water-separator; and the separation of water is effected by passing the gases through the sprayed water (using for this purpose water already separated from the gases) in a way similar to that in which the separation of tar was effected, as already described. This causes the water contained in the gases in the form of vapours or finely suspended liquid to combine to form drops and to separate from the gases. The water from the cooler hereafter referred to may be used; and this water may be warm, or even hot. Both the tar-separator and the water-separator, in which the liquids are spread in the form of fine spray across the space through which the gases pass, may be constructed as described in patent No. 11,206 of 1905. If fixed ammonia compounds be present, some milk of lime is run into the water-separator, together with the water, to prevent ammonia from being absorbed by the water run into the separator. If the temperature of the water leaving the separator be not high enough to decompose the fixed ammonia compounds, steam can be blown into the water before it leaves the separator, or the water may be heated some other way. The main part of the water is separated from the gases without carrying away ammonia. It is most advantageous, the patentee remarks, to conduct the process in such a way that the gases entering the separator have a temperature of from 90° to above 100° C., in which case the separated water leaves the separator so hot that no steam is necessary to decompose the ammonia compounds in the water.

The following is an example of how the separation of water is effected after the separation of tar has been effected as described: If coke-works coal, containing 12 per cent. of water, be distilled, and if, from this coal, 300 cubic metres of gases be produced per ton of coal, the gases contain 120 kilogrammes of water per 300 cubic metres of gases, or 400 grammes of water per cubic metre of the gases. If the gases enter the water-separator at 120° C. and leave it at 65° C., the gases, according to their capacity of saturation with water vapours at 65° C., leave the separator still containing 160 grammes of water per cubic metre; 240 grammes of water being separated in the water-separator. The gases coming from this separator are cooled (in a cooling apparatus arranged behind the water-separator) from 65° to 40° C., and leave the cooler, according to their capacity of saturation, at 40° C., with 50 grammes of water per cubic metre—110 grammes of water being condensed in the cooler. This water, condensed in the cooler at 40° C., contains some ammonia, and is run into the water-separator and spread therein in the form of fine spray in order to give off to the gases the ammonia absorbed in the cooler, and, by passing through the hot gases in the separator, the water is heated from 40° up to between 90° and 100° C., and gives off its ammonia to the gases—the water leaving the separator free from ammonia.

The gases, on their way through the separator, giving off their heat to the water run in and being cooled from 120° to 65° C., take up the ammonia from the water run into the separator; while the water separated in the separator cannot, at its temperature of separation, absorb ammonia from the gases. The gases coming from the cooler at 40° C. are treated with an acid, such as sulphuric, sulphurous, hydrochloric acid, or the like, or with a solution of a salt of an alkali, an earth alkali, magnesia, or the like, giving off ammonia and carbonic acid to the solutions in forming corresponding ammonia salts. Chloride or sulphate of lime, or of magnesia, in solution, or suspended in solutions, or water, may be used. For example, in washing with chloride of magnesia, the following reaction occurs:—

$$MgCl_2 + 2NH_3 + CO_2 + H_2O = MgCO_3 + 2NH_4Cl_2.$$

By the simultaneous action of the ammonia and carbonic acid of the gases upon the salt solution, in the case of the salts mentioned, corresponding ammonia salts and insoluble carbonates are formed.

If the salt solution be run into the ammonia washer at 40° C.—that is to say, at the temperature of the gases to be washed—no moisture from the gas will be condensed in the salt solution, and this will not be diluted, nor, by reason of the separation of the tar as described, will its purity be affected by tarry matter or other impurities.

In working as described, the separation of tar will be complete, and the tar, separated from the gases at a temperature above 100° C., being free from water and ammonia, will be more valuable than hitherto, and also the recovery of ammonia will be complete—the ammonia being extracted uniformly and in the form of a liquor "which is more concentrated and purer and more valuable than hitherto."

Coin-Freed Mechanism.

TOURTEL, J. M., of Queen Victoria Street, E.C.

No. 1751; Jan. 23, 1906.

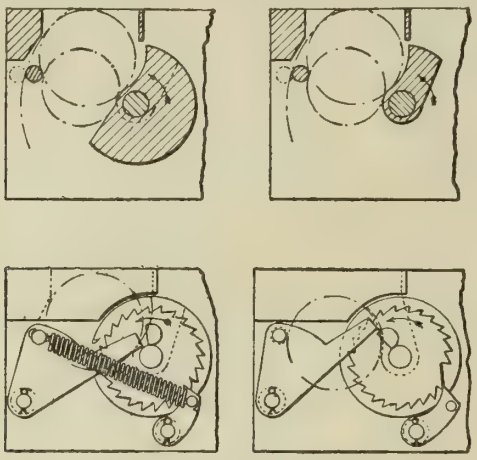
This invention, connected with coin-freed mechanism and coin-traps, relates to the kind of mechanism in which a spindle carries a ratchet wheel and a disc or stop; the wheel engaging with a lever which is disengaged by the coin when pressed forward by the stop. With such mechanism, it has hitherto been usual to provide a coin-receiver having a transverse or a longitudinal slot for the reception of the coin; but the present patentee, instead of using such a receiver, employs a coin-trap of the type in which a sliding plate is moved in one direction by hand—the return movement being effected by a spring; and the trap is provided with a finger or stop, which prevents the return movement unless the coin is discharged from it.

The mechanism and coin-trap are made as shown (p. 354). There is an operating spindle supported in a frame and bearing a disc finger or equivalent placed in proximity to one of the faces of the frame. Upon the spindle, or in operative connection therewith, is a non-return ratchet wheel engaging with a pawl fixed to the frame. Pivoted to the frame is a locking lever provided with means for engaging with a stop placed upon, or in connection with, the operating spindle. The lever is also provided with a pin or projection, called the "lift pin." Means are furnished for guiding a coin into the required position in which it will rest directly or indirectly upon the operating spindle, and against the lift pin. Upon the operating spindle being turned through the distance of the free-play, the finger will be brought against the coin and force it against the lift pin, removing the locking lever out of the path of the stop. The operating spindle may now be turned through a

complete revolution (during which the coin is ejected), when it will be again locked.

If a smaller coin be introduced into the mechanism, it will pass freely between the operating spindle and the lift pin, and drop into the till below.

The coin-trap is a cylindrical case placed axially at right angles to the coin-guide. Within the case is a plunger, preferably formed of two discs supported at a sufficient distance apart to allow a coin to pass between them. The cylindrical case is sufficiently open at one end to operate it, but preferably closed at the other. It is provided with two transverse slots (inlet and outlet) of sufficient size to allow a coin to pass; the inlet slot being at the top of the case and preferably near the open end, while the other slot is at the bottom and nearer the closed end of the case. Within the case is a spring, which presses the plunger forward against a stop, in which position it is ready to receive a coin. If a coin be introduced and the plunger be pressed back, the coin will drop through the bottom slot of the coin-trap case, and will pass into the coin-guide and rest upon the operating spindle and the lift pin.



Tourtel's Coin-Freed Mechanism.

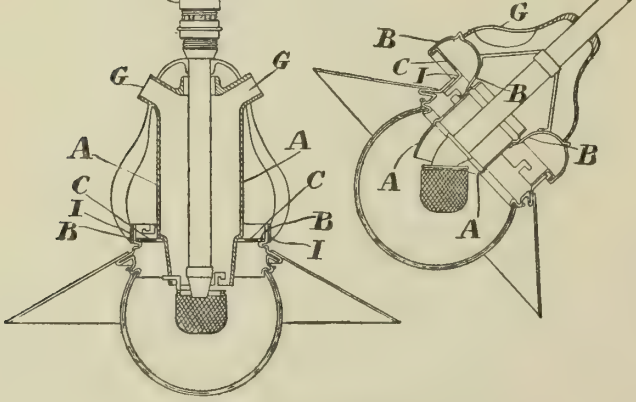
The first two illustrations show part of the frame of the device and the relative positions of the disc or finger and the pin or projection on the locking lever—the coins being shown in broken line. The other two show the ratchet wheel, the pawl engaging it, and the locking lever—a coil spring being used to hold the lever and pawl to their work. The fourth figure shows the mechanism released.

Incandescent Gas Burners and Fittings.

HELPS, GEORGE, of Nuneaton.

No. 947; Jan. 13, 1906.

This invention refers to fittings used for inverted or partially inverted burners, and consists in a special form of draught inducer or chimney. The portion below the supporting shoulder may be straight or of such shape that the mantle is held vertically while the globe and shade are at any angle; the deviation in the burner-nozzle inserted in the mantle being obtained by one or more bends—thus allowing the mantle to be placed practically central in the globe. The portion of the burner-tube below the holder (for carrying the globe, and nearest the mantle) may, however, be bent to keep the mantle in a vertical position.



Helps's Incandescent Burner Fitting.

In the first arrangement shown, the draught inducer or chimney A is supported by a ring B, having holes C for the ingress of air; the chimney having a shoulder rest upon the ring, which is attached to, or supported by, the globe-carrying ring. The chimney supports the mantle, and the waste-gas outlets are shown at G. The ring I is attached to the outer arms, and the carrier B is secured to the ring which carries the globe and shade. The mantle is secured to the chimney A; so that the chimney, mantle, globe, and shade are all carried by the arms.

In the second form of the invention, in addition to the draught inducer A, an upper portion is also provided. C are air inlets; the shoulders at D keeping the draught inducer in position and allowing (there being more than one shoulder) it to slide up the burner-tube. The arms are here attached to the ring B, which, in this case, is carried by the arms. The burner-nozzle is bent so that the mantle is vertical, although the globe and holder are at an angle to the vertical.

Producing Ferrocyanides from Cyanogen Contained in Gases.

JOHNSON, J. Y.; a communication from W. FELD, of Hönningen-on-the-Rhine, Germany.

No. 5775; March 9, 1906.

In order to obtain ferrocyanides from the cyanogen in coal gas and the like, such gas has been treated with a suspension, or solution of an iron compound (such as ferrous-carbonate, hydroxide, sulphide, sulphate, chloride, or mixtures thereof) together with a basic substance such as alkali, earth-alkali, magnesia, or ammonia. In some cases the ammonia present in the gas has been used as the basic substance, with or without the addition of a salt solution to the iron compound. The gases, as a rule, contain sulphuretted hydrogen, by the action of which upon the iron compound in the presence of basic substances, all the iron is converted into sulphide of iron. If "sulphide mud" (a mixture of ferrous sulphide and ferrous carbonate) be used, the ferrous carbonate in the mud is also converted into sulphide. The absorption of hydrocyanic acid by sulphide of iron in the presence of a basic substance is slow and incomplete, as such absorption is a secondary reaction, as shown in the following equations:—

(1) $FeSO_4 + 2NH_3 + H_2S = FeS + (NH_4)_2SO_4$.
(2) $FeS + 2NH_3 + 2HCN = Fe(CN)_2 + (NH_4)_2S$.
(3) $Fe(CN)_2 + 4NH_3 + 4HCN = (NH_4)_4Fe(CN)_6$.

The patentee has now found that the conversion into sulphide of iron is avoided if an iron compound be employed which, by treatment with a ferrocyanide of an alkali, an earth-alkali, magnesia, or ammonia, before the iron compound comes into contact with the gas to be treated, is converted into ferrous cyanide—

(4) $2FeSO_4 + Ca_2Fe(CN)_6 = 3Fe(CN)_2 + 2CaSO_4$.

To explain the process, the compound precipitated from ferrocyanide solutions by ferrous salts is referred to as ferrous cyanide, $Fe(CN)_2$, although this precipitate is supposed to be ferrous ferrocyanide, $Fe_2Fe(CN)_6$, or a compound of similar constitution, which frequently contains an admixture of alkali, earth alkali, and ammonia ferrocyanide in small proportion. It is essential for the process that this compound shall contain iron and cyanogen in the molecular proportion of one or two respectively, as indicated by the formula $Fe(CN)_2$.

In using ferrous sulphate as the iron compound and ferrocyanide of calcium for its precipitation, gypsum and ferrous cyanide are formed. If the gas be treated with this ferrous cyanide, the absorption of hydrocyanic acid becomes a primary one, as shown in Equation 5. The ferrocyanide used for the formation of ferrous cyanide can be soluble, or insoluble—for example, calcium-potassium ferrocyanide, $CaK_2Fe(CN)_6$, and the like may be employed.

The following example is given by the patentee to show how the invention may be performed, in which ferrous chloride ($FeCl_2$) is the iron compound employed and calcium ferrocyanide is used to precipitate the ferrous cyanide, while lime is the basic substance employed. The ferrous chloride is dissolved in water, and to this solution is added sufficient calcium ferrocyanide to precipitate all the ferrous chloride from the solution. To two molecules of ferrous chloride, nearly one molecular proportion of calcium ferrocyanide is used; but an excess of calcium ferrocyanide does not interfere with the process. Insoluble ferrous cyanide and soluble calcium chloride are formed. The calcium ferrocyanide solution may be added to the ferrous chloride, or the ferrous chloride may be added to the calcium ferrocyanide solution. The liquor thus prepared is mixed with at least two molecules of lime for each molecular proportion of ferrous chloride. The basic substance may be added to both the solutions either before or after the precipitation of ferrous cyanide. In treating the gas with this liquor, hydrocyanic acid is absorbed according to the following equation:—

(5) $3Fe(CN)_2 + 6Ca(OH)_2 + 12HCN = 3Ca_2Fe(CN)_6 + 12H_2O$.

The absorption is quicker and more complete than it would be if sulphide of iron were formed before the formation of cyanide, or if a mixture of sulphide and carbonate of iron (sulphide mud) were used. The process can be carried out with either hot or cold gas, and with either hot or cold liquor, and it is immaterial whether or not the gas contains ammonia. If there be ammonia in the gas, some insoluble ammonium-calcium-ferrocyanide is formed; but this formation is less in proportion as the heat under which the reaction is carried on is greater.

Instead of using a ferrocyanide salt to precipitate ferrous cyanide, the sludge which has already been used for treating gas, and which contains ferrocyanide in the required form, can be employed for precipitation. In any case, so much of the sludge must be added to the ferrous chloride solution that nearly one molecular proportion of calcium ferrocyanide is present to each two molecules of ferrous chloride. If after precipitation the liquor containing the ferrous cyanide should be too dilute, the precipitate may be separated from ferrous cyanide by filtration, and the ferrous cyanide be mixed with water or milk of lime in the required proportion before using it to treat the gas.

Automatic Gas Cut-Off.

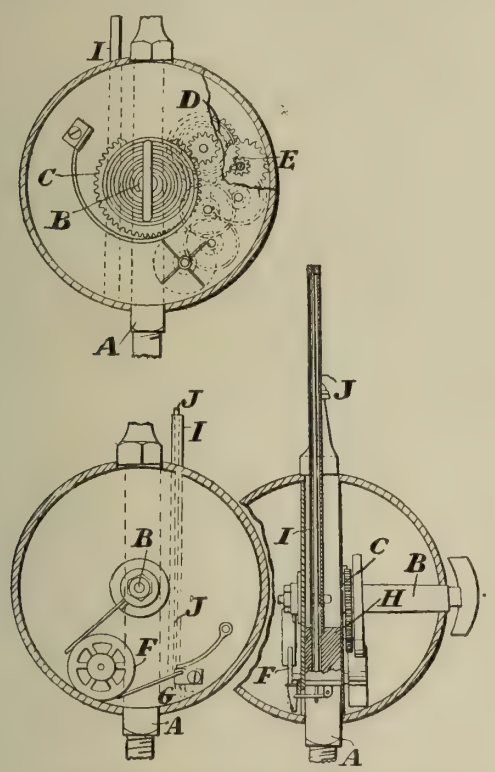
CAMPBELL, V. E., of Portland, Oregon, U.S.A.

No. 15,919; July 13, 1906.

This cut-off attachment for gas-burners used for heating, cooking, and illuminating purposes, has a valve normally held closed by a spring, but which is adapted to be locked, when opened, by a thermostatically operated brake, provided the gas is ignited. The invention consists of the spring-controlled valve employed, which, when opened, tensions the spring. The valve is geared to a train of wheels, one of which constitutes a brake wheel adapted to be contacted by a brake-strip operatively connected to a thermostat of peculiar construction, which, when heated by the ignited gas, causes the strip to be applied to the brake wheel and hold the valve open and its spring under tension.

The illustration (p. 355) shows a section through the casing, with one of the face plates and the mechanism in elevation; a similar view showing the opposite face plate and the parts on it; and a cross section of the apparatus.

Between the side plates is interposed a tube A, to be connected top and bottom with the burner and the gas supply pipe. A valve B (of the usual form) extends through the tube and the centres of the side plates, and a spring is coiled round it and fastened at one end to the valve and at the other end to a bracket extending from one of the side plates. A toothed sector C is secured to, and rotates with, the valve B, and meshes with a small gear secured to a shaft extending through the side plates. This shaft has a ratchet wheel D thereon, adapted to be engaged by a spring-pressed pawl mounted on a toothed wheel E loosely disposed on the shaft. A train of gears, located between the plates, serve to transmit motion from the wheel E to a shaft, on which is secured a brake wheel F. This brake wheel is normally contacted at its periphery by a spring check strip secured to, and movable with, the valve B. A brake lever G, pivoted on one of the plates, consists of a pivotally mounted non-resilient body and a resilient strip extending from it, and normally resting close to, but out of contact with, the periphery of the brake wheel.



Campbell's Automatic Cut-Off for Gas-Burners.

A block, secured between the plates, has an opening through it, from which extends a tube I of metal, which will readily expand when heated. The tube projects parallel with the tube A, and beyond it, so as to be heated by the gas-burner. The free end of the tube is closed, and has a rod J extending longitudinally through the tube and opening. This rod is of material which will not readily expand when heated; and its lower end extends beyond the block H, and has a laterally projecting finger, which is disposed under, and supports, an actuating lever pivoted at one end upon the lower portion of the block. This lever projects through a slot in one of the side plates and under the body of the lever G.

In using the device, the gas is turned on by the valve B. This will tension the spring and cause the sector C to rotate the gear and the shaft; while the ratchet wheel D will slip under the pawl. If the gas is not ignited, the spring will return the valve to its original position as soon as released, and also cause the rotation of the train of gears and the brake wheel F. If, however, the gas is ignited, the tube I will expand upward and carry the rod J with it, causing its finger to press against the actuating lever and swing it, and the body of the lever G, upward. The strip will therefore be pressed and held against the brake wheel F, and the gearing and valve will be prevented from rotating.

APPLICATIONS FOR LETTERS PATENT.

1524.—Griffin, C., "Gas-engines." Jan. 21.
1577.—Kratky, F., "Incandescent burner." Jan. 21.
1619.—Bray, J. W., "Incandescent burners." Jan. 22.
1640.—Campbell, H., and Craig, A., "Gas-producers." Jan. 22.
1703-4.—Blanchard, V. W., "Gas heater and cooker." Jan. 22.
1705.—Blanchard, V. W., "Gas air-heater." Jan. 22.
1706.—Blanchard, V. W., "Gas-furnace." Jan. 22.
1724.—Holland, L. C., "Gas-producers." Jan. 23.
1750.—Bushell, W. H., and Tomalin, L. R. S., "Vertical gas-range." Jan. 23.
1827.—Power, E., "Burners and mantle supports." Jan. 24.
1852-3.—Howarth, F. W., "Lighting apparatus for gas-lamps having two or more burners." A communication from Deutsche Gasglühlicht Akt.-Ges. (Auerges). Jan. 24.
1884.—Potter, W. G., "Mantles." Jan. 25.
1893.—Wigley, P., Arculus, G. N. & E. A., and Warry, J., "Inverted burners." Jan. 25.
1971-2.—Parker, T., "Distillation of coal and other carbonaceous substances." Jan. 25.
1990.—Parkinson and W. & B. Cowan, Ltd., and Cheshire, W., Regulating the supply of gas and air to atmospheric burners." Jan. 26.
2025.—Weil, R., "Incandescent burners." Jan. 26.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Friday, at the Chief Offices, Horseferry Road, Westminster—Mr. Corbet Woodall, M.Inst.C.E., the Governor, in the chair.

The Secretary (Mr. H. Rayner) read the notice convening the meeting; and the seal of the Company having been affixed to the register of proprietors, the report and accounts, which were given in the "Journal" last week, were taken as read.

METERS, STOVES, AND FITTINGS.

The Governor: It is now my duty to move—"That the report and accounts be received and adopted." In doing so, I desire to call your attention to a few features of interest. The expenditure on capital account has been £69,501. With the exception of a little over £4000, this has all been spent upon meters, stoves, and distribution plant generally. You will have observed that an item which has appeared for twelve years in the balance-sheet—viz., "Automatic meter supplies (fittings account)"—has now been liquidated. It will not appear again. It was our custom to charge to this suspense account a proportion of the cost of the pipes and fittings placed in consumers' houses. The custom had the approval of the Government Auditor as a temporary measure, pending the passing of our last Act; but we were pledged to him to extinguish the obligation by the end of 1906. To do this, we have had to divert some moneys which would otherwise have gone to depreciation of meters and stoves, and apply them to these fittings. Henceforth we shall be able to give due consideration to each class of this perishable plant—writing off for depreciation as may be necessary. The sum required in the past half year for clearing off the balance of the suspense account was £15,620. To show how great is the wear and tear upon meters and stoves supplied to consumers' houses, and the consequent necessity for liberal depreciation, I may mention that in 1906 we sent out 70,000 meters and 110,000 stoves, and received back 39,000 and 53,000 respectively. Our net increase was 57,000 stoves and 31,000 meters; but to secure these we had to handle 163,000 stoves and 109,000 meters.

THE REVENUE ACCOUNT.

Turning to the revenue account, you will, I think, agree with me that the result of the half-year's trading is good. On the occasion of our last meeting, I spoke hopefully of the future; and the statement in your hands justifies the expectation then expressed. Thanks to the cold weather with which the year closed, we have sent out more gas by 1·1 per cent. than we did in the corresponding half year. This is equal to 116 million cubic feet; and it has increased our revenue by £16,700, which is reduced, however, by certain increased discounts allowed, to £8354. There is a further increase in the rental from stoves on hire of nearly £2000.

REDUCED COST OF MANUFACTURE.

Due largely to the closing of costly stations, the reconstruction of works in use, the adoption of improved plant and appliances, and careful organized attention to details of carbonization, the cost of manufacture has been largely reduced. The greater quantity of gas sold has been made from a smaller quantity of coal and oil; and there has been a net saving of nearly £40,000 in manufactory charges. Residuals show a gain of £20,000; coke having brought a price 1s. per ton higher than in the corresponding half year. It is right I should tell you that of the saving in working costs £14,000 is on account of purification, and is chiefly due to the amendment of the law as to sulphur compounds, and the consequent great reduction in the use of lime. Expenditure upon repairs and maintenance of works has been less by £2434 than in 1905. But there has been no thought of checking renewals promising economy; and the works have throughout been maintained in excellent repair. The reconstruction of a large retort-house at Nine Elms has been completed, and the house equipped with inclined retorts, which are yielding excellent results. At Beckton, No. 2 of the original retort-houses has been reconstructed, and fitted with mechanical appliances. The demolition of the bench in No. 5 house at Beckton was commenced in November, in preparation for rebuilding this year. The early commencement was made in order to provide work for men who would have otherwise been unemployed. At all the stations, considerable works simplifying the handling of materials have been completed. Arrangements have been made for discharging the whole of the coal for our up-river stations at Beckton, at a considerable saving of cost.

REDUCED RATES.

We have another and unusual item for congratulation. This is the first time for many years that we have had to record any material reduction in the charge for rates. The saving of £12,000 under this head has been due, not to any falling of the rates in the pound, but to reduction in the assessment of the Company's undertaking obtained at the last quinquennial inquiry. Our rates are still, we think, extravagantly high; and effort will be made by the Directors on every available occasion to reduce this heavy charge still further.

COST OF DISTRIBUTION.

The costs of distribution show an apparent increase of £21,482. As, however, there is included a special sum of £15,620 applied in cancelling the balance of the automatic fittings suspense account, the true increase is not more than the growth in the number of consumers necessitates.

ANNUITIES.

The item "Annuities" shows an increase of £1392. This includes the contribution to the officers' superannuation fund; but the charge for officers' superannuation will be a reducing amount in the future. The sum now paid in annuities to workmen and officers is £47,888 a year.

THE NET RESULT.

The net result for the half year is that, after providing for the fixed charges, and setting aside £2500 to the insurance fund, which it is

advisable to somewhat strengthen, there is a profit of £363,940, to which has to be added £210,481 brought forward from the previous half year; making a total of £574,421 available for distribution. After setting aside £10,000 to the redemption fund, the Directors recommend a dividend at the rate of £4 8s. per cent. per annum; leaving £229,952 to be carried forward to the credit of the current half year, which period, I am glad to be able to assure you, will yield at least equally good results.

THE COMPANY AND THE IRONMONGERS.

A new departure the Company have made during the present half year is one which I am sure will be approved by the shareholders. It has long been felt that it would be desirable for the Company and the ironmongers of London to act together in promoting the use of gas-stoves. I am glad to be able to say that we have now come to an arrangement with many of the principal firms, so that they will act as coadjutors with the Company for the sale and hire of stoves and other gas appliances. It is too early to prophesy as to the result; but it is a step in the right direction, and cannot fail to be to the mutual advantage of both parties.

INSTRUCTION FOR THE STAFF AND THE CONSUMERS.

The measures for the special technical instruction of the outdoor staff, to which I referred at the last general meeting, have been in active progress during the past six months. A suitable assembly-room has been set aside for this purpose at Mare Street, Hackney—one of the Company's largest district offices; and here monthly meetings of the heads of the Chief Inspector's Department are held, at which a Director presides. Topics arising out of the operations of the department are discussed. Four times weekly technical lectures and practical demonstrations are given on the various scientific and industrial developments and improvements brought out from time to time in gas consumers' appliances. The average weekly attendance throughout these courses is 380. Already, we believe, marked success has been achieved; the working staff acquiring an increased knowledge of the proper use and value of gas for lighting and heating. I am glad to say that the arrangement announced to the shareholders a year ago, under which the services of a lady were engaged for the purpose of instructing the public in the management of gas cooking-stoves, has proved a great success. The lady demonstrator and her assistants have made a large number of calls; and their services are constantly in request by new consumers, to explain to them how to get the best results from the stoves. The Directors are gratified that this effort of the Company has been so much appreciated, and they believe that it is leading to a considerable increase in business. It must be understood that the new business which is being gathered in in satisfactory volume by the Company must necessarily be less profitable, per head of the consumers, or per million cubic feet of gas sold, than an equal bulk of consumption under older conditions. Every improvement of burners, stoves, or gas-fires, which the Company are delighted to welcome, as it means greater satisfaction on the part of the users, reduces the average consumption per service; while the greater attention now given to every consumer (small or large) on the books, entails increased working expense. We have lost more profitable business; but the new is broader based, and therefore probably more secure.

PROSPECTS FOR THE FUTURE.

As to the future, we feel some anxiety as to what will be the cost of coal in the year 1907-8. Prices much in excess of those of last year have been asked, and in some cases given, for new contracts; and it is impossible to prophesy with any certainty what may happen. Coal-owners will no doubt get as much as they can, and maintain big prices so long as they are able. When the high cost of fuel has seriously injured manufacturing industries, the cure will come automatically and painfully. It may be permitted to me to express regret, in this connection, at the recent removal of the duty on exported coal. The large quantities sent abroad tend at the same time to dissipate our national reserve and to increase the cost to the home consumer. It is surely reasonable that the country should receive some compensation for its heavy loss. In our own case, we have already replaced coal to a certain extent by oil for the manufacture of gas; and we can carry this replacement still further, if necessary. While we dare not at present contemplate reducing the charge for gas, we are resolved that nothing short of absolute necessity will induce us to raise it.

THE CENTENARY OF GAS.

The proprietors are probably aware that this week we have reached the hundredth anniversary of the lighting of Pall Mall with gas—a demonstration which was followed shortly afterwards by the formation of the Chartered Gas Company. Our story through the century has been one of continued growth and development, though chequered in some particulars. There is encouragement, in our report of to-day, for the hope that the prosperity of the Company will continue for a very long time yet to come. I now beg to move that the meeting do agree with and confirm the report.

The DEPUTY-GOVERNOR (Mr. Howard Charles Ward): I have great pleasure in seconding the motion.

REMARKS BY SHAREHOLDERS.

Mr. A. BURRELL asked for some particulars with regard to the property to be sold.

Mr. F. W. BRUCE said he should be glad to have some information as to the item of £148,000 odd invested in securities, as he noticed that the amount carried forward came to about £60,000 more than was invested. Was the difference put into the business?

Mr. KILLINGWORTH HEDGES said, as this was the first time he had been able to attend one of the meetings since the appointment of the new Governor, he wished to congratulate the shareholders upon the excellent appointment which had been made. There was one matter upon which he might touch, though he would not have ventured to do so in bygone days; but as they now had such a distinguished Engineer at the head of affairs, he might refer to it. It was the gas unaccounted for. This was rather more than the amount used for lighting the streets of London. He knew that in all gas companies there was a large quantity of gas that was not accounted for. But in their case it had been particularly large; and he would venture to suggest that the Governor should look into the matter, and see whether the amount could not be reduced. As a gas and electrical engineer, he was inclined to think there were many ways in which their great leakage might be brought down. If an electricity supply company had the same amount of leakage, they would soon have to shut up shop, as they had no bye-products to dispose of. He did not know whether the leakage had grown since the number of motor vehicles had increased, especially those of a heavy class for drawing loads. No doubt many persons had noticed vibration in their houses since the introduction of motors; and if gas-pipes were affected in the same way, it would be a serious matter in the future, as the number of motor vehicles increased. If the Engineers of the Company had noticed anything of the kind, he hoped they would report the matter to the Home Office, as a Bill would shortly be introduced for governing mechanical traffic. He recently took part in a deputation to the Home Secretary upon the subject, when that gentleman stated that he would be pleased to consider all industries affected by motor traffic.

The GOVERNOR: With regard to the amount invested, the explanation is that the depreciation fund for works on leasehold lands is not invested, but is used by us in the business—that is to say, it is invested in the Company's business.

Mr. BRUCE: Is the reserve fund and also the insurance fund included in the £148,000?

The GOVERNOR: Yes.

Mr. BRUCE: Where is the interest derived from on the depreciation fund?

The GOVERNOR: Although the amount is not invested outside the undertaking, inasmuch as we use it instead of money we should otherwise have to raise, we charge ourselves with the interest, and bring it to the credit of the capital fund. As to the property put up for sale, it was withdrawn, as the prices offered were not such as we were advised we ought to receive. I am much obliged to Mr. Killingworth Hedges for his interesting criticism; but I think he has lost sight of the fact that there was a Royal Commission on Motor Cars last year, before which our Distributing Engineer gave evidence. We represented in the strongest possible light the injury that gas and water mains were suffering by reason of the very much increased weight of traffic carried over the streets. In my observations to the shareholders six months ago, I think I mentioned that in a particular length of road ten years previously we had had a certain number of escapes to deal with, and in the year 1905 the number had increased ten times on the same length of road and mains. The position is certainly a serious one; and it does not escape the notice of the Directors or of their officers. Because of settlements which have taken place in various parts of London—due partly to the construction of underground railways and the vibration they cause—the roadway is carried on the concrete arch with in many cases little support from the ground below it. The gas absolutely unaccounted for is not such as to cause us to blush. In the past year the quantity was 5·26 per cent. Last year it was 5·50 per cent.; and the average of the London Companies was in that year 5·16 per cent. In the case of the Suburban Companies, it was nearly 6 per cent. In Glasgow it is 8·71 per cent. We used to be proud of the small amount of our leakage, and we regret to see it increase in however small degree. I think this answers all the questions that have been addressed to me, and I will now put the resolution.

This having been done, it was carried unanimously.

THE DIVIDEND.

The GOVERNOR: I now beg to move that the following dividends be declared: On the ordinary stock, at the rate of £4 8s. per cent. per annum; on the convertible 5 per cent. stock, £5 per cent. per annum; on the 4 per cent. consolidated preference stock, £4 per cent. per annum; and on the 3½ per cent. maximum stock, £3 10s. per cent. per annum—all to be paid on the 1st of March next.

Mr. T. A. GREENE asked what was the redemption fund?

The GOVERNOR said it was a fund the Company undertook, at the suggestion of the Parliamentary Committee, to form to write off capital not represented by assets. The total amount they had undertaken to write off was £1,000,000 sterling; and they were doing it at the rate of £10,000 half yearly. They had already written off £40,000, and they had now £20,000 more to invest.

The motion was put and carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR proposed the re-election of Mr. Ulick John Burke to his place on the Board, which he had held for very many years.

Mr. KILLINGWORTH HEDGES seconded the motion, and it was carried unanimously.

The GOVERNOR next proposed that Mr. Herbert Jameson Waterlow be re-elected a Director. He explained that Mr. Waterlow came up for re-election for the first time. He was chosen to fill the last vacancy on the Board; and he (the Governor) congratulated the shareholders on the choice the Directors were able to make. Mr. Waterlow had already proved himself, with his great business knowledge and experience, a most valuable member of the Board.

Mr. C. E. JONES, in seconding the motion, said the name of Mr. Waterlow was a very honourable one; and he thought the shareholders ought to congratulate themselves upon securing his services. He (Mr. Jones) heartily approved of the introduction of new blood.

The motion was carried unanimously.

On the motion of Mr. J. REESON, seconded by Mr. G. E. P. HODGE, the retiring Auditors (Mr. J. A. Stoneham and Mr. J. J. Walker) were unanimously re-elected.

The GOVERNOR: Ladies and gentlemen, this completes the business before the meeting, with the exception that I wish to mention to you that I have received a letter from Mr. Field, our late General Manager, who is Treasurer to the Church Building Fund at Beckton. The church is built on land bought from the Company, and is used almost exclusively by workmen in their service. Mr. Field calls attention to the fact that the money necessary for the construction of the building is not yet subscribed, and when the church is opened in April, it is very

desirable that there shall not be a burden of debt on it, seeing how poor the people are who will have the work to carry on there. The Company, I am afraid, are not in a position to make a grant out of their own funds; and I can only suggest to you that there are obligations upon us, as shareholders, to the workmen who serve us, which I think many are glad to recognize. If some of you are disposed to help the building fund of the church, your contributions will be very welcome. I should not think of making this suggestion were it for one denomination alone. We have provided for the Nonconformist congregation a room which serves the purpose of a chapel; consequently, there is no preference of one denomination over another.

Votes of Thanks.

Mr. Killingworth Hedges proposed a hearty vote of thanks to the Governor for the able way in which he had conducted the business of the meeting, and for so clearly answering the questions put to him.

The motion having been seconded, it was put and carried unanimously.

The Governor: Mr. Hedges, ladies, and gentlemen, on behalf of my colleagues and myself, I thank you cordially for this vote. We are exceedingly glad to be able to put before you so good a statement; and, as I have said already, we hope to repeat it in the half year that is now current. Before we separate, I should like to move—"That our best thanks be given to the officers of the Company for their excellent services during the past half year." You know there have been material changes in the staff of the Company. Our General Manager, our Chief Engineer, our Secretary, our Chief Inspector, are all young fellows full of zeal and energy, and, I am happy to say, with judgment and wisdom sufficient to guide their zeal. I cannot use words too strong to express our sense of complete satisfaction with the way in which their duties have been carried out. With regard to the Distributing Engineer (Mr. G. F. L. Foulger), he is not quite so young as he would like to be; but we see no sign of any falling off in his energy and capacity. With regard to the Engineers of the stations, I can say it is a great pleasure to walk round the stations with them, because of the heartiness with which they interest themselves in all that concerns the credit of the works and the advantage of the Company. I hear on all hands, both with regard to the works and the distributing staff, that the men are working as well and cordially as we could wish them to do. I therefore propose that the thanks of the shareholders be given to the officers and workmen for their services during the past half year.

The Deputy-Governor seconded the motion.

Mr. T. A. Greene said he thought the thanks of the proprietors were particularly due to the staff for the great ability they had displayed in the Company's business. To his mind, the position of Distributing Engineer was one of great anxiety, as that gentleman might be called upon at any moment, night or day, to superintend the repair of the mains.

The motion was put and carried unanimously.

The General Manager (Mr. D. Milne Watson), in the name of the staff, returned thanks for the very kind resolution the shareholders had just passed. He said he could assure them that it was a great pleasure at all times to the staff to do their duty towards the shareholders, and to work in their interests.

The proceedings then terminated.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented by the Directors of this Company at the half-yearly meeting on the 15th inst., they state that there is a sum of £92,555 available for distribution; and they recommend dividends, subject to income-tax, at the rates of 5, 12½, and 9½ per cent. per annum on the preference, consolidated, and new stocks respectively. After payment of these dividends, there will remain a balance of £53,305 to be carried forward. The Directors express regret that, with the exception of coke, the market for residual products still remains depressed; and this, coupled with the very considerable increase which has lately taken place in the price of coal, to some extent prejudicially affected the result of the past half-year's working.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £161,181; from meter and stove rents to £17,023; from the sale of residual products to £29,273—rents and transfer fees making up a total of £207,514, compared with £200,250 in the corresponding period of 1905. On the other hand, the manufacture of gas cost £106,231; distribution, £35,855; and management, £6303—the total expenditure being £165,900, against £158,298. The balance carried to the profit and loss account is £41,614, compared with £41,952 this time last year. The working statements show that 81,367 tons of Newcastle coal and "Solar" oil equal to 35,233 tons were used in the production of 1,256,560,000 cubic feet of gas, of which 1,160,413,000 cubic feet were sold and 1,175,413,000 cubic feet accounted for. The estimated production of residuals was: Coke, 50,873 tons; breeze, 6346 tons; tar, 891,259 gallons; and ammoniacal liquor, 23,360 butts.

Fire at the Rotherhithe Gas-Works.

At about 1 o'clock last Wednesday afternoon, a fire broke out at the Rotherhithe works of the South Metropolitan Gas Company. It appears that, through some cause at present unexplained, some gas which was in process of being purified escaped from one of the boxes, and igniting set fire to the floor and roofing of a shed in which the material used for purifying is stored. A foreman was burnt about the hands and face, though, it is stated, not seriously. The fire was extinguished by the joint efforts of the Company's officials and the Metropolitan Fire Brigade; valuable assistance being afforded by the floating fire-engine of the Surrey Commercial Docks Company. The damage done does not amount to more than £500 or £600.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 335.]

The following are the principal portions of the accounts of the Company for the six months ending Dec. 31.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £338,776 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,226,554; nominal amount added by conversion (less premium), £3,018,891—total, £8,245,445. The items of expenditure are as follows:—

Capital account to June 30, 1906		£4,909,481 15 3
Expenditure during half year to Dec. 31, 1906, viz.—		
New buildings and machinery in extension of works	£19,221 14 9	
Purchase of Land	15,826 15 7	
New and additional mains and services	24,928 10 0	
New and additional meters	13,203 4 4	
New and additional stoves	7,140 10 6	
		80,320 15 2
Total expenditure		£4,989,802 10 5
Balance		236,751 9 7
		£5,226,554 0 0
Nominal amount added by conversion, less premium		3,018,891 0 0
Total		£8,245,445 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store, including £24,451 15s. 4d. for labour	£351,120 3 2	
Purification, including £9516 3s. 9d. for labour	11,707 4 7	
Salaries of Engineer and Officers at works	13,833 5 10	
Wages (carbonizing)	57,984 4 0	
Repairs and maintenance of works and plant, including £51,342 16s. 10d. for labour, less £4940 13s. 3d. received for old materials	83,406 6 0	
		£518,111 3 7
Co-partnership		18,030 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £19,074 8s. 3d. for labour.	£23,661 13 8	
Salaries and wages of officers, including rental clerks	17,180 12 5	
Repairing and renewals of meters, including £5635 6s. 7d. for labour	23,808 13 5	
Repairing and renewals of stoves, including £11,079 0s. 3d. for labour	22,761 3 11	
		87,412 3 5
Public lamps, including £10,938 9s. 2d. for labour, and £6516 1s. 4d. for materials, less £16,571 7s. 3d. received for the same		523 3 3
Rents, rates, and taxes—		
Rents payable	£1,031 9 10	
Rates and taxes	44,109 8 2	
		45,140 18 0
Management—		
Directors' allowance	£2,502 6 0	
Salaries of Secretary, Accountant, and clerks	3,159 7 6	
Collectors { Ordinary	6,149 12 2	
Collectors { Slot meter	7,868 1 7	
Stationery and printing	2,591 13 7	
General charges	8,691 5 6	
Company's Auditors	112 10 0	
		31,074 16 4
Law charges	£1,536 15 0	
Parliamentary charges	4 5 3 4	
		1,951 18 4
Bad debts		1,633 15 7
Pensions and officers and workmen's superannuation, sick, and accident funds		7,137 7 11
Gas Referees and Official Auditor		124 10 9
Total expenditure		£711,109 17 2
Balance carried to net revenue account		191,226 16 11
		£902,336 14 1

Receipts.

Sale of gas—		
Michaelmas, at 2s. per 1000 feet	£229,204 17 10	
Christmas, at 2s. per 1000 feet	346,735 0 8	
	£575,939 18 6	
Public lighting	14,737 15 0	
		£590,677 13 6
Meters in use (316,862)—		
Company's meters at rent: Ordinary, 102,052; slot, 206,090	£34,495 8 11	
Company's stoves at rent: Ordinary, 72,681; slot, 172,484; fires, 21,707	27,717 9 7	
		62,212 18 6
Residual products—		
Coke, less £2912 5s. 9d. for cartage; £10,358 12s. 9d. for labour, &c.	£154,593 14 4	
Breeze, less £183 0s. 1d. for cartage; £2753 18s. 4d. for labour, &c.	6,466 1 2	
Tar and tar products, less £4240 6s. 0d. for labour	32,282 17 4	
Sulphate of ammonia, less £4694 7s. 2d. for labour.	51,678 9 2	
		245,027 2 0
Rents receivable		1,731 14 1
Transfer fees		87 15 0
Sundries		2,599 11 0
Total receipts		£902,336 14 1

The net revenue account shows a sum of £165,261 7s. 2d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 were as follows: Reserve fund, £178,396; renewal fund, £25,333; insurance fund, £106,737. In the last-named account, a sum of £1500 is charged for "loss on coal by heating."

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store June 30, 1906.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store December 31, 1906.
Tons. 68,459	Tons. 631,001	Tons. 594,289	Tons. 878	Tons. 104,293

Statement of Residual Products.

Description.	In Store June 30, 1906.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1906.
Coke—cwts.	160,664	7,368,275	1,923,800	5,338,983	266,156
Breeze—yards	14,903	126,787	46,250	73,278	22,162
Tar—gallons	731,247	5,757,669	5,408,929	67,245	1,012,742
Ammoniacal liquor—butts	8,881	186,831	183,948	..	11,764

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,517,123	Thousands. 172,872	Thousands. 5 858,520	Thousands. 6,112,125	22,362 incandes't 766 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £61,527; coke and breeze, £10,611; tar, sulphate, and ammoniacal liquor, £55,299; and sundries, £275,126. The figures this time last year were: Coal, £60,175; coke and breeze, £4665; tar, sulphate, and ammoniacal liquor, £55,754; and sundries, £262,712. A sum of £57,800, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £37,089. The figures last year were £65,596 and £30,942. The item, "Monazite sand suspense account," now stands at £19,420, compared with £24,139 at the end of December, 1905.

CENTENARY OF GAS LIGHTING IN PALL MALL.

[From the "Daily Telegraph," Jan. 29.]

If Londoners had been given to the celebration of centenaries, they would have illuminated the town from end to end last night. Or, at least, the clubs and houses in Pall Mall would have shown their bravest "lines of festal light." For just a hundred years before vast crowds had assembled in Pall Mall to gaze at a row of gas-lamps which a certain German, named Winsor, had set up in front of the colonnade before Carlton House, in honour of King George III.'s birthday. . . . These were practically the first gas-lamps seen in London, though Murdoch, a Scotsman, had made some tolerably successful experiments a few years before, and Watt and Boulton's factory at Birmingham had blazed with gas in 1802, on the occasion of the Peace of Amiens. Even the Carlton House exhibition, however, failed to convert the scoffers, learned as well as unlearned, for in 1809 Sir Humphry Davy declared that it would be as easy to bring down a bit of the moon to light London with as to light it with gas. With like fatuity some scientists spoke of electricity as a mere toy of the laboratory, not foreseeing the tall arc lamps of our own day, which outshine the very moon herself. The first gas-works failed miserably; and in 1813 two people were actually prosecuted for endangering the health of the lieges by "the making of gas-light." But a year later the battle was won, and the general lighting of the Metropolis by the new illuminant began. Grosvenor Square was the last home of the lost cause. . . .

Gas has done wonders for London; and it will do still more. There were those who thought that its doom was written when its more sparkling younger sister appeared on the scene. But rivalry has only disclosed its latent possibilities. Without entering into any comparison of the relative values of gas and electricity as an illuminant for the public streets, it is undeniable that some of the best-lit thoroughfares of London owe their brightness to gas, in the new guises which it has put on during the last few years. Improved processes are continually being discovered. The call of the public is always for more light, and the great streets of London are now simply radiant in these winter nights. . . . People exiled from home have been known to long even for the golden gleam of yellow gaslight that beautifies a dripping London pavement. Gas and electricity are turning night into day. Only the foolishly adventurous set off for the Land of the Midnight Sun; it is here in London all the year round. Some of its effects may not be altogether desirable. It is an enemy of the "beauty sleep." It tends to keep people up later than is good for them. It is partly responsible for the increased whirl and rush of modern life. It has added on an hour or two to the day, by docking them from the period apparently meant for repose. But, on the other hand, the benefits it has conferred are incalculable. A well-lighted city is, nine times out of ten, a city well administered. That is one of the salient tests of good government. And just as sunlight kills the lurking germs of disease, so light of all kinds is the greatest foe of vice, crime, and all the evil things that skulk in the dark corners of a great city. Money wisely spent on street illumination is money saved. The slums need to be lit up just as much as the main thoroughfares; and when they are thus lit, they cease to be slums. Their inhabitants flee from the light like the crawling insects which haste to hide themselves anew when one has turned over the stone under which they had made their habitation. *Fiat lux.* Pall Mall ought certainly to have kept its centenary last night.

MR. HERRING ON THE GAS SUPPLY OF EDINBURGH.

The Use of Incandescent Burners in the City.

Last Friday evening, the first of a series of lectures upon municipal matters, promoted by the Corporation of Edinburgh, was delivered to a very large audience in the Synod Hall, Edinburgh, by Mr. W. R. Herring, the Gas Engineer, who took for his subject "The Gas Supply of the City."

Bailie Maxton, who presided, intimated an apology for absence on behalf of Lord Provost Gibson, who had another engagement, and introduced the lecturer, stating at the same time that other lectures by the principal Corporation officials, would be delivered at intervals of a fortnight, by which, it was hoped, the citizens would obtain a better knowledge of the work of the city.

Mr. Herring said he had had some difficulty in compressing his subject so as to bring it within the scope of one short lecture, and he could only hope to convey to the audience a general impression of the character and extent of the gas undertaking. In the course of a short historical account of gas supply, he said it was rather coincident that he should appear before them that night, practically a hundred years after the introduction of gas lighting in the streets of London; for it was on the 27th of January, 1807, that Pall Mall was first illuminated with coal gas, a distinguished company being gathered together to witness it, and, according to the records of "The Times," they were greatly impressed and much pleased with it. In 1814, coal gas made its first advance as an organized movement. The first definite step in the direction of affording a supply of gas to Edinburgh was made in the year 1816, in the establishment of the Edinburgh Gaslight Company. In November of that year, the Company applied for, and obtained, early in 1817, permission from the Town Council to open the streets and lay pipes. The Company was incorporated on March 1, 1817; and the 17th of the same month it was resolved to make application to Parliament for an Act to charter their existence. Constructional works were, however, commenced upon the present site of the New Street Works, in May of 1817, before the Act was obtained; and a gas supply was distributed to the citizens in April, 1818. The Company was not permitted to occupy the field alone, for they found in 1823 the Leith Gas Company starting in opposition; their intention being to supply oil gas. The Leith Company, evidently finding oil gas was unsuitable or unprofitable, obtained the sanction of the Town Council to lay mains throughout the district under the jurisdiction of the City Corporation, in order to supply coal gas in competition with the Edinburgh Company. In 1824, the Edinburgh Oil-Gas Company (ostensibly for the portable supply of compressed gas) was inaugurated, of which Sir Walter Scott was Chairman; this Company being ultimately absorbed by the Edinburgh Gaslight Company. From this date onwards, there appeared to have been considerable rivalry between opposing concerns, and particularly the Edinburgh and the Edinburgh and Leith Companies, both of whom displayed considerable energy in canvassing for customers and winning the public favour. This policy resulted in the laying of duplicate supply-pipes in the principal streets in Edinburgh; and while the citizens must have suffered considerable inconvenience in consequence of the disturbance of the streets, the public did not appear to have derived any advantage from the competition, as, he understood, the price charged for gas was the same by both Companies. In 1866, the Companies appeared to have realized the suicidal policy of competing for the public favour; and consequently they entered into a formal agreement whereby the district was apportioned in such a way as to avoid the open competition that had hitherto prevailed. Though, at the outset, the agreement was little more than a formal undertaking entered into between the parties, its conditions appeared to have been carried out up to the time of the transfer—and, in fact, it formed the principal subject of the Bill which the Leith Company promoted in Parliament at the same time that the Municipal Bill was being considered.

After a narrative of the proceedings which culminated in the transfer, Mr. Herring said it was not necessary to pursue in detail the controversy that prevailed at the time. It might not, however, be altogether inopportune for him to express an opinion as to the bargain then entered into. From his knowledge of such affairs, he could emphatically say that the two Corporations made an excellent bargain at the time. Then followed a description of the constitution of the Gas Commission, and their statutory powers, financial and administrative, after which the lecturer went on to say that since the transfer of the undertakings in 1888, the business of gas supply had increased by 50 per cent., the gas consumers had increased from 62,000 to 92,000, and the gas output had augmented proportionately. At the time of the transfer, the price of gas was 3s. 6d. per 1000 cubic feet, with coal at about the same price as at present. To this extent, therefore, the consumer could gauge the advantages of municipalizing this particular concern, especially when he reminded them that the reduction of 9d. per 1000 cubic feet represented an annual saving on the gas bills of some £72,000. The administration of the undertaking involved a turnover of more than half-a-million of money per annum. Nearly 200,000 tons of coal were now employed for producing the gas demanded by the public. During the winter period, 1000 tons of coal were used per day, and 10½ million cubic feet of gas were sent out. This represented a total illumination of 315 million candles for the 24 hours. A single hour's consumption during the winter afternoons required a million cubic feet of gas, which was capable of yielding a light of 30 million candles. This quantity of gas was distributed among the 92,000 consumers by means of 400 miles of main pipes, which would reach from Edinburgh to London, if stretched in a single line, to say nothing of the 800 miles of service-pipes leading the gas from the mains to the consumers' meters.

Mr. Herring went on to point out that the construction of entirely new manufacturing works at Granton, and the abandonment of the three old stations in Edinburgh, Leith, and Portobello, were rendered necessary by the increasing demand for gas. Notwithstanding the introduction of their fair competitor, the electric light, the consumption of gas continued to increase; and, in the opinion of those best able to judge, it was likely to do so for very many years to come. The

condition of the plant at the old manufacturing stations was such as to make it impossible to extend or reconstruct them economically; and after most mature consideration on the part of the Commissioners, it was found that a new scheme was urgently required. It was predicted at the time that such a scheme would not increase the burden upon the gas consumers; but, on the other hand, it was anticipated that it would lighten it. As the result had proved, it had lightened the burden to the extent of £24,000 per annum, this sum being represented by the reduction in the price of 3d. per 1000 cubic feet which was granted immediately after the new works were opened. The gross profits resulting from the annual operations had been increased from £38,000 in 1896 to £91,000 in 1906; the price of coal remaining approximately the same in each period of comparison. This increase of profit had not been obtained at the expense of the workers' wages; for since 1900 these had been increased, on an average, 8·64 per cent. The great scheme, therefore, which had now been completed, so far as the present demanded, had been carried out without cost to the consumer or to the ratepayer. It was being paid for out of profits resulting from the employment of modern plant and modern methods. In order to convey some idea of the character of the works and the extent of the operations at Granton, he proposed, with the aid of limelight views, to show and to briefly describe, its principal features, from which, he thought, the audience would be able to see where some of the economy was being brought about, as well as appreciate the advantages which had accrued to the operatives; for though they now employed only about one-third of the men formerly required, the tax upon their physical energy was very considerably less than it used to be with the old methods—in fact, the guiding principle in the construction of the works had been that brains, and not muscle, should be the controlling factors.

Twenty-three lantern slides were exhibited on the screen, illustrating the principal features of the Granton works, and explanations were given by the lecturer, following which a demonstration of lighting efficiency by ancient and modern methods concluded the lecture. A number of worn-out flat-flame burners were started. These gave a very poor light; but by placing a hood over them, the lighting was greatly improved. The contrast between flat-flame and incandescent burners was also illustrated. In the course of showing these lighting effects, Mr. Herring said he had arranged that men would be at the doors of the hall, and, on leaving, the audience would get one of the hoods, so that they could try them for themselves. The point at issue at present was whether they should continue to burn gas by flat-flame burners. It was all very well to do this when they had no other method of burning it; but to-day they had, within the reach of everybody, one which would give them eight times more light. He had been at some pains to ascertain the extent of the use of incandescent burners in their district. He had taken a census during the present survey of the meters, which, unfortunately, was not yet complete; but up to the previous day it showed that 75 per cent. of customers were using gas otherwise than by the flat-flame burner; and 65 per cent. of them were employing incandescent burners. This meant a majority of the gas consumers. They had at times heard it said that the incandescent mantle was not suitable for the working man's kitchen. That would show them how the working man answered the question. Up to date, they had examined 27,000 meters in working-class districts, and of these, 17,000 were utilizing the gas by incandescent burners. He had no doubt, when they had completed their census, they would have the strongest evidence possible to justify the Commissioners in adjusting their methods of manufacture to modern requirements. The audience would have observed that the vestibule and corridors of the hall had been fitted up with incandescent burners. He wished to emphasize the fact that those who desired to continue to burn gas could get a most efficient light by it.

On the motion of ex-Bailie STEVENSON, lately Convener of the Electric Lighting Committee of the Town Council, a vote of thanks was accorded to Mr. Herring. He said they were all agreed that in Mr. Herring they had one of the most advanced and most expert men in the country in connection with gas undertakings; and that at Granton they had gas-works which were not only a credit to the city, but to the inventive genius of Mr. Herring.

A NEW PURIFIER-HOUSE FOR CAMBRIDGE.

Progress of the Gas Company.

The Cambridge University and Town Gaslight Company are contemplating the reconstruction of their purifier-house, at an expenditure which was estimated by the Chairman (Mr. E. H. Parker), at the recent half-yearly meeting of the shareholders, to be between £6000 and £7000. In calling attention to the matter, he said that the old purifying-house was of bad construction, and was, no doubt, a weak point. Unless purifying-houses were well constructed, and well ventilated, they were a source of danger, and the work proposed had really become urgent.

With regard to the business of the Company during the six months to Dec. 31, the Chairman said the Directors were again able to congratulate the shareholders on the satisfactory state of their business. There was a decreased profit on the half year of £286; but this was after reducing the price of gas by 2d. per 1000 cubic feet, which meant about £1000. So the fact that their figures only showed a decreased profit of £286, proved that there had been a large increase in the business. The capital account was £2309 overdrawn; and the Directors were going to ask for power to issue at their discretion £10,000 of ordinary stock and £2500 on loan or debentures. It was not intended to issue all the £10,000 at once; but the Board were of opinion that, when taking powers, they had better take powers for a sum which would last for several years. Some time this spring, they would offer for competition perhaps about £3000 of stock. The balance which would be carried to the profit and loss account from the revenue account was £6162, which was sufficient to pay maximum dividends on the three kinds of stock (amounting to £5112), and to pay the mortgage interest (£579), leaving a balance of £471 to the credit of the profit and loss account. As showing the continued prosperity of the Company, it might be mentioned that the ordinary consumers had increased by 108, ordinary cookers by 76, heating appliances by 51, slot-meters by 222, and slot-cookers by 184. These were all perfectly satisfactory increases; and another gratifying feature was the amount of gas which had been obtained from each ton of coal carbonized. In the past half year they had secured no less than 11,323 cubic feet per ton. This was a very good result; and great credit was due to their Engineer and Manager (Mr. J. W. Auchterlonie) and the carbonizing foreman under him.

The report was adopted; and the Directors were subsequently authorized to raise additional capital, as suggested by the Chairman in the course of his remarks.

GAS-WORKS PROFITS AND THE RATES.

The Question Raised at Spalding and Congleton.

The disposal of the profits accruing from the gas-works has been engaging the attention of the Spalding Urban District Council, in consequence of the action of the Local Government Auditor (Mr. J. A. Cole) in surcharging two members with £1000, which was appropriated towards a reduction of the general district rate. The members concerned were those who signed the cheque for the amount. Until recently, the Board ruled that the profits earned by the undertaking must either be spent on improving the works or be absorbed by a reduction in the price of gas. When, however, the charge for gas came as low as 2s. 6d. per 1000 cubic feet, there was a general feeling that the rates ought to benefit from the success of the concern; and accordingly the Council applied for a Provisional Order to enable them to devote the surplus profits in this way. The Order was obtained; and during the year ending March, 1905, £920 was apportioned to the relief of the rates. This was passed by the Auditor in due course; and so for the twelve months to March last £1000 was voted in a similar manner. Upon the Auditor paying his next visit, however, he refused to allow the item. A lighting rate is levied in the district; and until this is extinguished, the Auditor contends that nothing must go to the district rate. The clause in the 1903 Order on which the point turns is this—

> The residue (if any) of such revenue shall be applied first in reduction of the gas-rate levied under the Local Act, and secondly shall be carried to the credit of the improvement rate levied under that Act; but no part of such revenue shall be carried to the improvement rate when the price to ordinary consumers exceeds 3s. 4d. per 1000 cubic feet.

The matter was referred to the Local Government Board, who replied that they saw no reason to interfere; and the Auditor thereupon confirmed his ruling. There the matter rests at present.

At Congleton, also, there is a desire to relieve the rates by means of profits from the gas-works, which it seems cannot be gratified under existing conditions. At the last meeting of the Town Council, the Town Clerk (Mr. E. A. Plant) submitted a letter from the Board stating that they had carefully considered the representations contained in the statement in support of the application of the Council for a Provisional Order to amend the Congleton Gas and Improvement Act, 1866, and the Provisional Order of 1904, so as to enable the Corporation to devote the surplus gas revenue to the borough fund or general district rate, as the Corporation should from time to time decide; but as the Board did not think a sufficient case had been shown for issuing a Provisional Order, they were not prepared to entertain the application.

Reduction in Price at Fenton.—The Fenton Gas Committee have reported to the Urban District Council their decision that the price of gas should be reduced by 3d. per 1000 cubic feet to all consumers from April 1 next. The gas will then be charged at the rate of 3s. 4d. per 1000 feet, and be subject to a rebate of 10d. if paid within one month from the date of the demand-note. Gas for motive power, where the consumption is not less than 250,000 cubic feet a year, will be subject to a rebate of 1s. 1d. per 1000 feet, if paid within the month.

Supply of Gas as a Stand-By.—A correspondent asks if any of our readers can inform him whether a gas company working under the Gas-Works Clauses Acts are called upon to supply gas for stand-by purposes. He knows of a case where suction-gas plant has been put in, and a supply of coal gas is asked for in order that it may be utilized in the event of the plant breaking down. He says clause 11 of the Gas-Works Clauses Act, 1871, hardly seems to cover the case from the gas company's point of view; but whether it does so or not, under their Private Act they are only called upon to supply gas at 8-10ths pressure at the service, and therefore the gas-engine would come off badly. Our correspondent adds that particulars as to the practice of others on this subject will be much esteemed by him.

Dynamite Explosion in the Edinburgh Gas-Works.—On Tuesday last, two men named Angus M'Kay and Peter Campbell, were injured by an explosion of dynamite at the old gas-works in New Street, Edinburgh. In connection with the litigation with reference to the pollution of a brewery well, the Commissioners are engaged in driving mines, with the view to tracing the source of the pollution. Blasting by means of dynamite has been carried on for some time, ignition of the charge being obtained by an electric current derived from a battery on the surface. Holes having been drilled, and the charges inserted, with an accompanying fuse, and the cable attached, the men were withdrawn from the mine and the battery connected. The shots did not come off; and after the lapse of a minute the battery was disconnected. A man named Murdoch, who was in charge of the work, and Campbell, descended the mine and disconnected the cable from the fuse, for the purpose of testing the cable. Murdoch then returned, leaving Campbell below. On reaching the surface, he switched on the battery and sent M'Kay down to assist Campbell in finding the defect. The end of the cable was found to be defective. It was cut off, and, without acquainting Murdoch, Campbell applied the cable to the fuse, which ignited. Both men were rather badly injured, and were taken to the Royal Infirmary. Towards the end of the week, however, they were reported to be recovering as well as could be expected.

GAS v. ELECTRICITY AT DEVONPORT.

There is every prospect of a very keen contest between the Gas and Electricity Departments of the Devonport Corporation when the Town Council of the borough meet next week. Both are desirous of the credit of lighting the main thoroughfares of the town; and the battle between the advocates of the two methods of illumination seems likely to be waged with exceptional vigour. For a considerable time the subject has been under the consideration of a Special Committee representing the gas and electricity undertakings and the department which has control of the streets. When the electricity works were erected, the lighting of the principal thoroughfare—Fore Street—with electric arc lamps was decided upon with practical unanimity. Electric cables were also laid in the adjoining streets, and efforts have been made from time to time to induce the Council to consent to the erection of arc lamps in these streets as well. In the meantime, however, the Gas Department has been pushing its claims, and carrying out costly and successful experiments. A high-pressure installation on the Keith system has been laid down in one street; another was lighted with Welsbach self-intensifying lamps; and a third with Sugg's double burners. The Electricity Committee, on their part, replaced the arc lights in Fore Street with modern "flame" arcs, for which an illuminating power of 2300 candles is claimed, and suggest the erection of similar lamps in the thoroughfares which are the subject of controversy. The final decision on the matter appears likely to be influenced by the question of cost. Hitherto the Electricity Committee have charged £22 10s. per annum for each of the 17 arc lights in use in Fore Street. They now propose to put up 40 more flame arcs, and to charge for them (including those at present in use) a uniform price of £12 10s. each per annum. The Gas Committee's proposal is to light the important thoroughfares with triple Kern burners in modern lanterns. Each of these will give an effective illumination of 420 candles with a consumption of 15 cubic feet of gas per hour; and the cost per lamp will be £6 4s. 8d. per annum. Excluding Fore Street, which it is agreed shall continue to be lighted by electricity, there would be 64 of these improved gas-lamps, as against the 40 arc lights proposed. The cost for the streets of which the lighting is in question would be, therefore, £500 per annum for electricity and £399 for gas. On the ground that gas lighting is more economical, the Special Committee have recommended that gas should be adopted; and this recommendation is endorsed by the Surveyor's Committee. The Electricity Committee will, however, endeavour to persuade the Council to reverse this decision; and a good deal, no doubt, will be said as to cost per candle power, and also as to the reduction of the cost of lighting Fore Street, which would result from the extension of electric lighting and the lowering of the present charge of £22 10s. per lamp to £12 10s. Outside the area where the electricity cables are laid, incandescent gas-lighting is being steadily extended. There are 1100 gas-lamps in the borough, and before next Christmas all the old flat-flame tips will be replaced by incandescent burners.

METROPOLITAN WATER BOARD.

The first Meeting of the Board after the Christmas recess was held last Friday, under the presidency of Sir Melvill Beachcroft, the Chairman. The Finance Committee, in a long report, set forth a scheme for placing the collecting staff of the Board on fixed salaries in lieu of commission, with a view to greater uniformity, efficiency, and economy; and their proposals were adopted.

The Water Examination Committee presented a report on the results of the chemical and bacteriological examination of the London waters for the twelve months ended the 31st of October last, by Dr. A. C. Houston, the Director of Water Examinations to the Board, who stated that during the period named (which is the first completed year since the establishment by the Board of their own scientific department for the examination of the London waters), 11,487 samples had been examined, exclusive of 529 collected for special purposes. In the course of some provisional conclusions at the end of the report, Dr. Houston said that no praise could be bestowed on the qualities of the raw waters, which were known to be contaminated with sewage. But as regards the water actually sent out for consumption, the case was different. The processes of subsidence and filtration effected the almost entire removal of the suspended matters, reduced the colour to a marked extent, and brought about a great reduction in the original amount of organic matter. Bacteriologically the total number of microbes was reduced about 98 per cent. It was important, he urged, that the extension of storage capacity and of filtration area should more than keep pace with the increased rate of consumption of water; and it was equally important that the pollution of the raw waters should be so controlled in the future that the total impurities entering the rivers should tend to diminish rather than to increase in quantity. It was also obvious, considering the question apart from any existing limiting regulations or engineering difficulties, that it would be desirable to be able to abstract an unlimited amount of raw Thames water, whenever the conditions (physical, chemical, and bacteriological) were specially favourable for storage purposes, subject, of course, to the maintenance of a minimum, but adequate, flow of water down the river.

The return relating to the supply of water for the month of December showed that the total average daily supply was 209,503,000 gallons. The number of houses, &c., supplied was 1,058,000; the estimated population being 6,872,768, and the mean supply per head per day 30·4 gallons, compared with 29·9 gallons, the corresponding figure for December, 1905. The quantity of water in store in impounding reservoirs at the end of the month was 7164 million gallons, against 6150 million gallons at the end of December, 1905.

Sale of Gas Stock.—At a recent sale by auction, £160 of stock in the Elland-cum-Greetland Gas Company realized £240; while £280 of stock in the Otley Gas Company was disposed of at £125 per £100.

GREAT YARMOUTH WATER BILL.

Statement by the Directors of the Company.

In the course of a statement which the Directors of the Great Yarmouth Water Company have prepared for consideration by the Town Council, on the subject of the Bill which is now being promoted, they point out that a further supply of water will be essential to the progress and prosperity of the town; and after the most careful inquiry, they find there is no better available source than the Bure. If this source of supply should unfortunately be closed to Yarmouth, they do not see whence the water needed in the near future can be obtained.

The scheme proposed at the present time, the Directors say, differs in several very important respects from that brought forward last year. It establishes the following additional important safeguards for the purity of the water: (1) They propose to obtain power to put in force the Rivers Pollution Acts. (2) To agree with the riparian owners to prevent pollution. (3) To provide a sedimentation basin—a watertight reservoir—on high ground. (4) To provide also double filtration, employing a method not hitherto used at Ormesby. With regard to these proposals, the application of the Rivers Pollution Acts would be to the upper part of the Bure, and would in no respect affect the river near Yarmouth. The possession of the powers conferred by these Acts, which the Company are authorized to put in force at Ormesby, has been attended with satisfactory results. At Norwich, the period for sedimentation provided—where the supply is also from a river, the Wensum, the condition of which is stated to be practically identical with that of the Bure—is only for three-quarters of a day's consumption. At Yarmouth, five days' consumption would be provided.

The necessity for securing a further supply in the near future is, the Directors remark, obvious when it is considered that the demand is now for 460 million gallons a year, and that the annual increase is about 10 million gallons; while the supply provided by Ormesby must be limited. With regard to the connection with Lowestoft, the scheme originated with the Yarmouth Company; the Lowestoft Company subsequently consenting to co-operate. The arrangement is one of mutual advantage. For both places an additional supply will be needed; and, by combining, they will obtain what they require at less cost. Lowestoft is merely a very good customer, and does not obtain any authority over the Yarmouth works. The Directors have had the supply of water from wells under their careful consideration; but their engineers and geological advisers warn them that wells from the chalk are not available.

In order to avoid interfering with the yachts which frequent the river and the traffic generally, a close time would be agreed on, when water would not be pumped. The Bill has the approval of the Yarmouth Port and Haven Commissioners. The Directors do not look for any special pecuniary advantage from the extension; but they feel that no other course than that proposed is open to them, to enable them to provide the supply required by the town.

THE CHARGE FOR WATER IN LONDON.

Objections to the Water Board's Bill.

At the Meeting of the London County Council on Tuesday, the report of the Parliamentary Committee on the subject of the Bill which the Metropolitan Water Board have promoted for next session to alter the charges for water, to which reference was made last week (p. 295), was presented, and its adoption moved. Thereupon Sir J. Benn, M.P., moved an amendment to add to the recommendation to oppose the Bill words to the effect that the Borough Councils should be invited to join with the County Council in resisting the proposed addition to the water charges of London. He protested against water ratepayers throughout London being compelled to pay under this scheme at least £10,000 a year more than at present, in order to relieve those who were outside its borders. He thought the Water Board should first seek to equalize the basis of rateable value. When this was done, he could see no objection to equalizing the water-rate. Mr. Radford, M.P., said the Council would only weaken their position by inviting the petty local authorities of London to co-operate with them in this opposition. Sir Melvill Beachcroft said that what the Board wanted was a periodical revaluation of property outside London. The County of London would not have to pay any extra charge unless there was a deficiency rate; and this was hardly likely to occur when the estimated surplus of the Board for this year was £49,000. The Board were under statutory obligation to produce a unification scheme before they had had full time to estimate the difficulties of the situation. Mr. H. P. Harris thought the Council might well co-operate with the Local Authorities of London in this matter, and see where the Bill required amendment in the interests of London. After further discussion, the amendment was carried in an altered form. Under it the Parliamentary Committee were authorized to communicate with the Borough Councils with a view to obtaining their co-operation in resisting the increased burden the Bill proposed to put upon London, to the relief of ratepayers outside. The recommendation as amended was then adopted.

On the same day, the City Board of Guardians held a meeting, at which Mr. W. H. Wagstaff, the Chairman of the Assessment Committee, made a statement bearing upon the effect of the Bill above referred to upon the City. He said its provisions would destroy the basis of assessment adopted for many properties. The promoters proposed a water-rate which should not exceed 5 per cent. of the rateable value. In the City, the present payment for water was at the rate of 3 per cent. on the rateable value of premises over £200 per annum, and 4 per cent. in the case of those under this amount. The Committee, in fixing the net rateable value, deducted from the gross rentals sums to represent rates, taxes, lighting, housekeeper, water, &c. Included in the deductions was the water-rate based upon the 3 per cent. and 4 per cent. scale. Should the proposed 5 per cent. scale become operative, the effect would be to reduce the net rateable value of (say) a property of the gross rental of £228,895 from £127,164 to £125,068. With

rates at 7s. in the pound, there would therefore be a saving in this case of £733 per annum; while it would also be noted that the 5 per cent. water-rate would be paid on £2096 less rateable value—another saving of £104 for the ratepayers. Taking the net rateable value of the City on April 1 next at £5,373,276, and applying to it the same principle, the reduction would be £67,356, which, with rates at 7s. in the pound, represented a saving of £23,574 per annum to the ratepayers, and a further saving of £1346 per annum on the payment for water-rate. There would ensue a reduction in the amount collected in the City for the consolidated rate, the proportion of rates payable to the London County Council, the Metropolitan Asylums Board, the equalization rate, and the Metropolitan Common Poor Fund. The reduction would also in some measure jeopardize the accuracy of the financial calculations of the Bill. This could not be a matter of unconcern to the City, when it was realized that the new scheme, in its first year, showed an estimated deficit of £21,000, which deficit would be considerably accentuated should a reduction in rateable value become general. The question was the more important because the Water Board had power to levy a general rate, in addition to the water charges, to meet any deficit; and should this power be utilized, all property in the City would have to pay the rate, whether water was consumed or not. A further hardship would be inflicted upon the ratepayers from the fact that leases and agreements could not be amended to meet this new outlay. The Committee suggested that steps should be taken to insert a clause making the change operative from the date of the next quinquennial revision, or, failing this, to remove all doubts by inserting provisions enabling assessment authorities to act.

Metropolitan Gas Company of Melbourne.—The profits of this Company for the half year to Dec. 31 were £57,500. A dividend of 5s. per share has been declared for the six months, a sum of £14,500 has been added to the reserve fund, and £2500 carried forward.

A Brighton Gas Poisoning Case.—A Brighton hairdresser named Bennett was last Saturday week found lying dead in his bedroom; and it was discovered that a gas-tap was turned full on, while a cork which had been fitted into the dead-end of the pipe had fallen out. A theory advanced at the inquest was that during the night the plug blew out of the dead-end; and the deceased, detecting the escape of gas, fancied it was from the gas-lamp, and, in mistake, turned the tap on. A verdict of "Death from misadventure" was returned.

New Joint-Stock Companies.—The Tar Patents Solidifying and Distilling Company, Limited, has been registered with a capital of £10,000, in £1 shares, to adopt an agreement with the Tar Patents Solidifying Syndicate. As mentioned in the "JOURNAL" last week, the South Luton District Gaslight and Coke Company, Limited, has been formed, with a capital of £30,000, in £5 shares (3000 preference), to adopt an agreement with the Gas-Works Extension Corporation, Limited, for the acquisition of the Markyate Gas-Works. The minimum cash subscription is 10 per cent. of the shares to be offered to the public. The first Directors are Messrs. N. Wilkinson, E. Jarvis, and J. K. Abel-Knapton. The Crail Gas Company, the registered office of which is at 58, Nethergate, Dundee, was registered in Edinburgh last week, to take over the undertaking of the Crail Gaslight Company. The capital is £1000, in £1 shares—the same as in the old Company. The public are not asked to subscribe.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the monthly meeting of the Edinburgh and Leith Gas Commission on Monday, it was reported that the revenue of the Commission between Whitsunday and Jan. 7 had amounted to £174,223. Between May 16 and Dec. 15 the gas-rental amounted to £95,229—an increase of £5951 over the corresponding period of the previous year. The output of gas during December showed an increase over the same month of 1905 of nearly 16 million cubic feet; and since May 16 there has been an increase of over 45 million cubic feet.

Mr. W. R. Herring delivered a popular lecture upon the gas supply of the city in Edinburgh last night, a summary of which is given elsewhere. It was a clearly expressed deliverance, and must be of much service to the community in bringing to their notice a fact which they are like to lose sight of, that there is something good in gas lighting—much better than most gas consumers think.

The visit of the Eastern District Juniors to the Glenboig Fire-Clay Works this afternoon was a fitting round-off to the previous week's visit by the members of the Western District to similar works at Bonnybridge. To-day's visit, notwithstanding that the footing was upon snow and ice, and in places mud, and that there was a cold foggy atmosphere, was a very happy one. This was to be attributed to the warmth of the reception which was accorded to the visitors by the officials of the Company; and to the amount of information which they so freely imparted. The works at Glenboig are very extensive, and bear every trace of their not having been built upon any preconceived plan, but of having grown with the development of the business—bit having been added to bit as necessity arose. On the return journey, the remark was made that the members of the Association who do not take advantage of the opportunities afforded of visiting works of interest to makers of gas are not aware of the amount of loss which is theirs. When at the works, attention was called by one of the visitors to the cosmopolitan nature of the Company's attitude towards lighting questions. The workshops are lighted with oil gas, the yards with electric arc lamps, the offices with electric incandescent and paraffin lamps, and the Workmen's Institute with acetylene gas.

Many people are disposed to cry out before they are hit. Surely that is the disposition of a writer, apparently one of the staff, in the "Dundee Advertiser" of yesterday. Dealing with the price of coal, he recalls that it has already risen 2s. 6d. per ton. He anticipates a further rise of 1s. per ton, and reaches the conclusion that corporations, in respect of the production of gas, are feeling the effects of the enhanced quotations. There is comfort to the writer that, in this respect, they have fared well in Dundee, the whole of the coal for gas purposes having been contracted for till April. But there is a sad outlook for them, because, if, as is expected, another 1s. is to be added to the price of coal before existing contracts expire, the effect on the cost of gas will be pronounced. He reasons that every 1s. per ton advance in the price of coal represents an increase in the coal bill of some £3500 per annum, equal to 1d. per 1000 cubic feet of gas produced; and, assuming that, by the end of April, coal is 3s. 6d. per ton dearer than it was last year, the coal supply will cost £12,250 more than the figure for the current twelve months—and "in that event, it will be

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 331.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	+½	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14⅜—15½	+½	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- mouth Gas & Water { 10 p.c. B 7 p.c. Pref. 6 p.c.	28—29	..	4 16 7
51,810	10	,,	7		17—17½	..	4 0 0
53,200	10	,,	6		15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262—267	..	4 13 8
300,000	,,	,,	9⅜	Do. New	200—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	232—237	..	4 14 11
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11⅜—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8⅛—9⅛	−¼	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108½—110½	..	4 10 6
1,443,280	Stk.	Aug. 30	5⅞	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	108—111	+1	4 10 1
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6⅜	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5⅛	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	Jan. 31	11	European, Ltd.	24—25*	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	17⅛—18⅛*	..	4 9 2
15,203,110	Stk.	Aug. 15	4⅘	Gas- light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb.	97—99	−3	4 8 11
2,600,000	,,	,,	3⅜		90—92	..	3 16 1
3,799,735	,,	,,	4		107—110	..	3 12 9
4,193,975	,,	Dec. 13	3		84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	182—185	+1	4 6 6
473,600	Stk.	Aug. 15	3⅜	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	167⅓—168½	..	4 3 1
144,140	Stk.	Sept. 13	7⅞	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3⅝	Monte Video, Ltd.	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	110—111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅓—14¼	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6⅛	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅛—8⅛	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5⅝—5⅞	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¾—12⅞	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13⅛	−⅛	5 18 6
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 5
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	128—130	..	4 4 7
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
575,000	Stk.	Aug. 15	5⅜	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	and B 3½ p.c.	104—106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10⅝—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- worth and Putney A 5 p.c. B 3½ p.c. C 3½ p.c. 3 p.c. Deb. Stk.	—	..	—
255,636	,,	,,	6⅜		140—145	..	4 9 8
75,000	,,	,,	5⅝		113—115	..	4 17 6
79,416	,,	Dec. 28	3		79—82	..	3 13 2
779,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	104—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.	121—124	+1	4 0 5
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

necessary to raise the price of gas by 3½d. per 1000 cubic feet." Mr. Yuill should be thankful to be thus forewarned, because he will have time, between this and April, to mature plans for the overcoming of the dire state of matters foreshadowed.

The appointment of Mr. W. Wilson, of Kirkintilloch, to be Gas Engineer and Manager at Falkirk is a matter upon which he is to be congratulated, and that more particularly when we take into consideration the quality of the other candidates. Of the four who were left in last week, when the matter came to a vote, the first to drop out was Mr. T. Lighbody; the second, Mr. J. Lang; and the final vote was between Mr. J. M'Leod and Mr. Wilson, the latter getting the post by nine votes to five. Mr. Wilson is a most energetic young man; and I suppose the considerations which weighed chiefly in his favour were the varied experiences which he has already had, and the fact of his having been able to reduce the price of gas at Kirkintilloch, in the five years he has been there, by 1s. per 1000 cubic feet. Mr. Wilson is the fourth Gas Manager who has served the Falkirk Corporation since they acquired the undertaking in the beginning of 1895.

Last week I gave some particulars regarding the lighting of the streets of Kirkcaldy, and stated that a report would probably be forthcoming from the Electrical Engineer for the burgh. This report has already been prepared. In it he states that if the average cost per mile of electric arc lighting in the town is five times as much as the average cost of gas lighting per mile, for that extra cost the town is getting twelve times as much light. If, in the opinion of the present Town Council, the quantity of light in the average gas-lighted street is all that is required for lighting the tramway route, then the statement is correct that £700 a year is being thrown away; but it is not correct if a better light is considered necessary. The Engineer quite agrees with the Council of three and four years ago, that the existing arc lighting does not light the principal streets of Kirkcaldy any too well, and that that quantity of light was absolutely essential on the tramway routes for the safety of street traffic and the general public. If this were admitted, then the cost of arc lighting was rather more than twice as cheap as the average gas lighting, light for light.

The paper read by Mr. H. O'Connor, F.R.S.E., before the Royal Scottish Society of Arts in Edinburgh on Monday, upon a new valve for dry gas-meters, which he and Mr. W. Alexander have invented, is one to which attention should be drawn. Its efficiency can, of course, be only tested by use; but, upon the face of the subject, a reduction in the number of directions of travel of gas through a meter, and the making of the directions easier, should effect a considerable improvement in the efficiency of the meter, in, at least, the regularity of delivery, and probably also in accuracy of registration.

The Directors of the Newcastle and Gateshead Gas Company have decided to recommend the payment for the past half year of dividends at the rate of 4 per cent. per annum on the preference stock, and of £4 12s. 6d. per cent. on the ordinary stock.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Feb.* 2.

Demand has been fairly well sustained, but it has not been sufficient to bring about a further advance in values. Probably severe weather over the greater part of Europe has done something to check buying, though existing contracts have necessarily had to be covered, and prices have been favourable for the operation. The closing quotations are £11 16s. 3d. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 to £12 1s. 3d. per ton f.o.b. Leith. For February delivery spot prices would readily be paid, but makers are not concerned to sell beyond prompt delivery unless at a premium. For March-April delivery, there are sellers at £12 5s. to £12 7s. 6d. per ton, according to port; but these prices have not attracted buyers.

Nitrate of Soda.

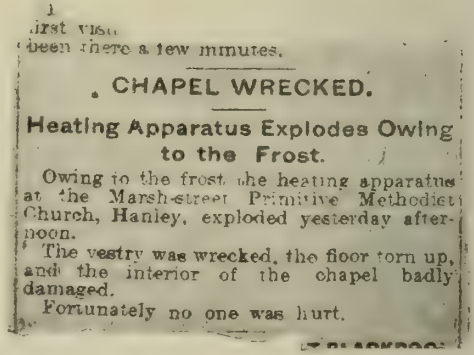
This article is quiet in all positions, and spot prices remain at 11s. 3d. per cwt. for ordinary, and 11s. 9d. for refined quality.

Tar Products. LONDON, *Feb.* 2.

Markets have been steady during the past week. Pitch is firm, though prices are unchanged. Business has been done on the east coast at 24s. 9d. for prompt delivery, and at 25s. to June. On the west coast in Liverpool and Manchester, there is not very much offering, though makers at the former place are reported to be willing to accept 25s. to June, which price, however, has not yet been paid. In South Wales, there does not seem to be any anxiety on the part of consumers to buy; and on the Continent, they appear to be fully bought for delivery this side of June, and will only consider offers for September-March at low figures. Creosote is very firm, though London prices are at a disadvantage compared with other districts. Some quantity of oil was sold for delivery to June at 2¼d. in bulk at makers' works; while some quantity was sold in barrels over the same period at a price which would leave about the same figure. In the Midlands and the North, oil is difficult to obtain. A fair business has been done in the former district at 2d. to the end of June; but in the latter, 2¼d. is reported to have been offered and refused. Makers' idea of price is 2⅜d. to 2½d.; and they have very little to offer. Solvent naphtha is steady but quiet, and it is possible to buy some quantity upon the east coast at 1s. 1½d.; while in London business could be done to June at 1s. 4d. to 1s. 4¼d. for small quantities. Benzol, 90 per cent., is quiet, and it is improbable that anything over 11½d. could be secured in London—makers being willing to sell at 1s., but unable to get this figure. In the North, business has again been done at prices varying from 10d. to 10¼d. at makers' works. There is little offering in 50-90 per cent., which is steady; nor do buyers appear very anxious to purchase. Carbolic acid remains in the same position. Both English and Continental consumers seem

THIS ACCIDENT

could not have occurred if the Chapel had been heated by Wright's "St. Andrew" Gas-Heated Steam Radiators.


first visit
been there a few minutes.

CHAPEL WRECKED.

Heating Apparatus Explodes Owing to the Frost.

Owing to the frost the heating apparatus at the Marsh-street Primitive Methodist Church, Hanley, exploded yesterday afternoon.

The vestry was wrecked, the floor torn up, and the interior of the chapel badly damaged.

Fortunately no one was hurt.

Do the Churches in your district adopt Wright's Method of Heating? If not, this occurrence might be brought to their notice, to the mutual advantage of all parties.

Wrights the Radiator People.

well bought and not at all anxious for further quantities; and they will not offer anything over the prices which they have already indicated. There is no alteration in the market for crystals. Toluol is steady. Some quantity was sold in the Midlands at equal to 1s. 1½d., casks included, at makers' works for delivery between now and the end of June next. There is nothing of importance doing in anthracene.

The average values during the week were: Tar, 13s. to 17s. Pitch, London, 25s. to 25s. 6d.; east coast, 24s. 6d. to 25s. 6d.; west coast, 24s. to 25s. Benzol, 90 per cent., 10½d. to 11½d.; 50-90 per cent., 11d. to 11½d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 4d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅛d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2½d. to 2$\frac{9}{16}$d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8⅞d. Naphthalene, £6 to £9 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

There has been practically no alteration in the market for this article during the past week, though prices have been well maintained. In some instances, makers have succeeded in selling at the prices quoted by them, and have now raised their limits. Small parcels are being sold in London for immediate delivery at low prices; but there is no change in the figures quoted by the principal London Gas Companies. In Hull, business has been done at £12 for prompt; and it is reported that £12 2s. 6d. has been paid for February-April. In Liverpool, business has been done at £12 1s. 3d., and at much higher figures forward. In Leith, makers report having realized £12 2s. 6d. for some quantity for prompt delivery. There is, however, very little offering in this quarter.

Scott-Snell Lamps for Dock Lighting.—Messrs. Anderson and Duffield, Limited, have secured an order for an additional quantity (between 500 and 600) of improved Scott-Snell lamps from the Mersey Dock Board, for the lighting of all parts of the docks. This is a very valuable order, from a financial point of view; but it is important in another respect, inasmuch as it represents a triumph of gas over electricity, for which the above-named firm and all engaged in the gas industry have reason to congratulate themselves.

A Coroner's Opinion of Water-Slide Chandeliers.—In the course of the inquest on the couple who were found dead from gas suffocation at Ealing, under circumstances recorded in last Tuesday's "JOURNAL," a gas-fitter named Humphries said he had examined the fittings in the house, and found that the water-tube of the chandelier in the downstairs front room was defective. On hearing this, the Coroner (Dr. Gordon Hogg) inquired whether it was "one of those abominable things that required being filled with water." The witness said it was; and in reply to a further inquiry as to whether the escape was due to the tube not being filled with water, he remarked that in all probability the tube was filled the day before, but owing to a defect the water had filtered through. The verdict was "Accidental death."

COAL TRADE REPORTS.

Lancashire Coal Trade.

Last week's prognostications were fulfilled to the letter. The Lancashire Coal Sales Association met at Wigan on Wednesday last, and resolved that the price of all steam and engine coal should be advanced 10d. per ton on and from the 1st inst. The next day, the colliery owners in the Manchester district also held a meeting, and, fortified by the action of the meeting at Wigan, advanced the price of all descriptions of house coal 5d. per ton, with a rise in engine and boiler fuel corresponding to the increase at Wigan. The result has been to put the price of all sections of coal throughout the country on practically the same level. Contract prices, especially with regard to gas coal and cannel, are kept remarkably secret; but there is no doubt whatever that prices for these commodities have risen. The gas coal now being used by the Manchester Corporation costs 1s. 6d. per ton more than the contract price. Quotations on the Manchester Coal Exchange for coal at the pit's mouth, are as follows: Best house coal 14s. 6d. to 15s. 6d. per ton, secondary 13s. 6d. to 14s. 3d., common 10s. to 12s., burgy 8s. 10d. to 9s. 6d., medium 8s. 10d. to 9s. 6d., best slack 8s. to 9s., medium 7s. 6d. to 8s., common 6s. 9d. to 7s., coal for bunkers and export 10s. 6d. to 11s. 6d., furnace coke 17s. to 24s. A 20-feet seam of coal at a depth of over 550 yards has been discovered at Baggeridge Wood, near Wolverhampton, after nearly ten years' sinking operations. The seam is on the estate of Lord Dudley. A general advance of 1s. per ton has been announced on coal in South Yorkshire.

Northern Coal Trade.

With slight interruption, owing to the delay of steamers through the storms, the coal trade has been very brisk; and the tendency of prices has been upwards. The collieries have been working fully, and there is an ample demand for coal of all classes; while for one or two kinds, there is some pressure. Best Northumbrian steams are advanced to from 14s. to 14s. 6d. per ton f.o.b., second-class are from 12s. 6d. to 13s., and steam smalls are a little easier at from 7s. to 7s. 6d.—while for forward delivery, in some cases, higher quotations are made. In the gas coal trade, the demand is a little easier; but this is partly because of the interruption in the arrival of steamers through storms. Apart from this, though the home deliveries are rather less than they were—as usual when February has been entered on—there is more doing in export; and the output is thus well taken up. Prices of gas coals range from about 11s. 6d. to 12s. 9d. per ton f.o.b., according to quality; but even higher figures are spoken of. Some heavy Continental contracts are now in course of negotiation—including those for the Stockholm Gas-Works, taking 115,000 tons of coal, delivered over the season—and the settlement of these in a week or so may do something to define the prices that are likely to rule in the contracts for the year. Coke is firm generally; and gas coke is steady—the reduction

ZANCIG!

M. Zancig: "This?"

Madame: "A photograph."

M. Zancig: "Correct—What of?"

Madame: "Warings' Premises—most up-to-date in London."

M. Zancig: "Yes; how do they heat them?"

Madame: "Ninety-three 'Gas-steam' Radiators, supplied by

RICHMOND'S."

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

in the output influencing the prices. Good gas coke varies from about 13s. to 14s. per ton f.o.b.

Scotch Coal Trade.

Trade is steady and strong, with prices rising; the Fife coalowners having intimated an advance of 1s. per ton. Ell and splint are in demand for shipping, and supplies are scarce. A large business is being done in steam coal. Washed stuffs and dross are being readily taken up. The prices quoted are: Ell 11s. 3d. to 12s. 9d. per ton f.o.b. Glasgow, splint 12s. to 12s. 3d., and steam 10s. 9d. to 11s. The shipments for the week amounted to 261,206 tons—an increase of 6318 tons upon the preceding week, and of 3866 tons upon the same week of last year. For the year to date, the total shipments have been 785,272 tons—a decrease of 2969 tons upon the corresponding period of 1906.

Surveyors' Evidence.

A discussion on this subject which has been going on for some weeks in the columns of "The Times" has drawn from Sir George Livesey a statement of fact which it will be interesting to reproduce. In the course of a letter, Mr. Humphreys-Davies said "the amount of a valuation depends upon the purpose for which it is made," and "the value of the same thing necessarily varies according to the basis upon, and the purpose for, which it is made." Sir George says he does not know what these statements mean, unless it be that "the amount of a valuation depends upon," or varies with, the question whether it is made for the buyer or the seller. This brings him to his statement of fact, which is as follows: "This Company has in the last 25 years bought a large amount of property, while our sales have been considerable. We found a thoroughly capable and in every way trustworthy Surveyor; and the Directors trusted him. The final purchase under a recent Act of Parliament was completed about two or three months ago. It was the freehold of a town property owned by a great corporation, who were represented by one of the best-known and most highly respected Surveyors. He asked £22,000 or £23,000 for the property; while the Company's Surveyor said it was only worth £15,000. There was no hurry, and as negotiations progressed the figure gradually came down to £20,000, £18,000, and at last to £16,000. When our Surveyor called upon me to confer, he said he still believed that £15,000 was the value, and that by holding out he thought the other side would come down. I told him we left it to him to do what he thought right; and within a month he reported a settlement at £15,500." Sir George makes no comment beyond saying that, had the Company gone to a jury, probably witnesses on one side and the other would have given both higher and lower figures, and the jury would have split the difference.

Opposition to the Mitcham and Wimbledon District Gas Bill.

The Wandsworth Borough Council at a recent meeting resolved to present a petition against the Mitcham and Wimbledon Gas Bill. Last Tuesday, the General Purposes Committee, to whom the matter was referred, reported that they had decided to include the following in the petition to be presented: (1) That the financial provisions of the Bill be opposed. (2) That clause 15 be amended so as to provide that notice as to the sale of stock shall be given to the Council as well as to the Councils of other districts in the Company's area of supply. (3) That the proposed standard price of 3s. 9d. per 1000 cubic feet is too high—the present price charged by the Company being 3s. 6d.; and that the proposed reduction of the illuminating power from 15 to 14 candles should carry a reduction in the price of gas. (4) That clause 30 be opposed with the view of substituting a flat-flame burner for the argand burner for testing illuminating power; that the proposed table photometer be excluded on account of its unreliability; and that local authorities have power to appeal to the Board of Trade to prescribe any other photometer or standard light as well as the Company. (5) That the provision that the Company shall not be liable to any penalty in respect of defects in illuminating power unless the average of three consecutive tests, made at intervals of not less than one hour, be less than the prescribed illuminating power, be objected to, and that a penalty be incurred in respect of one test as at present. (6) That provisions be inserted for testing calorific power and for tests to be made at any time, or with greater elasticity as to times, than as prescribed by the Gas-Works Clauses Act, 1871. (7) That a proviso be added to clause 34 similar to that in the Wandsworth and Putney Gas Act, 1900, that, before laying or relaying pipes in streets not adopted by local authorities, notice be given to the authority, who shall notify the reasonable depth and position where such pipes are to be laid. (8) That clause 40 be amended so that pipes for ancillary purposes may only be laid in the borough with the Council's consent. (9) That the Company be made subject to the provisions of the Acts which regulate and control the Metropolitan Gas Companies.

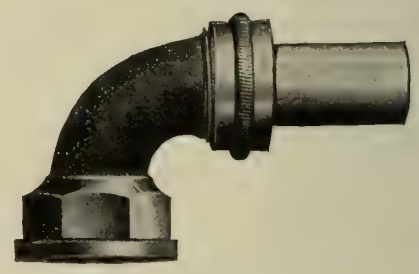
Costly Public Lighting by Electricity.—The following extract from the report of the Local Government Board Auditor on the Long Eaton Urban District Council accounts affords eloquent testimony to the "luxury" of electric lighting: "The cost of public lighting for the year ended March last (1906) appears to be £1367 1s. 5d., of which £1170 10s. 5d. is for electric lighting. For the year ended March 31, 1903, the cost was only £638 4s. 10d., or less than one-half the cost for this year."

Lincoln Water Supply.—At a recent meeting of the Water-Works Committee of the Lincoln City Council, the whole of the circumstances connected with the boring scheme were considered, together with the recommendation of Professor Hull, to which reference has already been made in the "JOURNAL," that the boring at Boultham should be continued to the limit of the sandstone, in the hope that the supply may improve in quality. Mr. Percy Griffith, the Engineer for the scheme, attended the meeting, and addressed the Committee at some length. After a full discussion, it was decided to complete the boring as originally contracted for, by going down an additional 180 feet. This will mean a work of about two months, and the cost will probably be something like £1500.

SAWER & PURVES

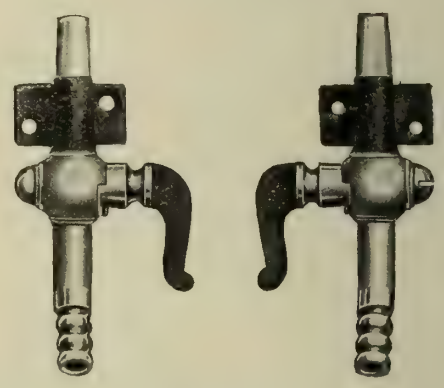
Stove Fittings.

STOVE BEND.



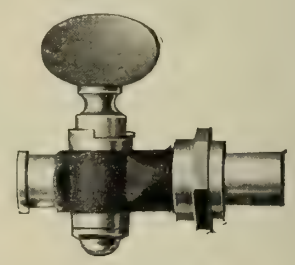
No. 112.

WING HOB TAPS.



No. 114.

STOVE TAP.



No. 110.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

Poll on the Hull Gas-Works Purchase.

The poll which was demanded after the ratepayers' meeting (*ante*, p. 168) in connection with the Hull Corporation Bill—which seeks, among other things, power to acquire the works of the East Hull Gas Company—was taken last Wednesday. The various portions of the Bill were voted on separately; and all were carried—though there was only a small majority in favour of the part dealing with the gas-works purchase. The figures were: In favour of acquiring the undertaking, 3143; against, 2427; majority for, 716. As there is a total electorate of 47,284, it will be seen that, even on such an important local question as this, not very much more than one-tenth of those qualified to vote took the trouble to express an opinion one way or the other.

Water Supplies in Flintshire.

Several public authorities in Flintshire are bestirring themselves in the matter of taking advantage of the passing of the Birkenhead Corporation's mains—conveying water to that borough from the Rivers Alwen and Brennig, in Merionethshire—through their districts, to obtain public water supplies. According to the scheme set forth in the Bill, which has been already noticed in our columns, the aqueduct will pass at a distance of about seven miles from Holywell. Both the Rural and Urban Councils are on the alert as to the feasibility of tapping the main, and drawing supplies therefrom. For many years the subject has engaged the attention of the Urban Council, and various schemes have been discussed and abandoned. Close to the town is situated the famous St. Winifred's Well, with its effluent of over 3 million gallons daily. But this spring is several hundred feet below the level of the town, and to deliver the water would involve the construction of new reservoirs and continual pumping. The initial cost of such a scheme has been estimated at £3500, *plus* the cost of pumping. The cost of a pipe-line from the Birkenhead Corporation's proposed main to the town is, of course, a matter of conjecture; but the subject is engaging the consideration of the two Councils, and it is understood that negotiations are pending. The subject is exciting much interest in Flintshire.

Proposed Gas Supply of Belper from Derby.

At the meeting of the Belper Urban District Council last Wednesday, Mr. Smith introduced the question of the price of gas in the town, and moved the following resolution: "That, owing to the high price of gas charged in Belper and district, which in a great measure is no doubt owing to working expenses and other causes arising from the system of dual ownership of works, this Council do at once appoint a Committee, consisting of the whole Council, to take into consideration the advisability of inviting the Derby Gas Company to extend their mains so as to supply Belper; further, that the Council give their support to the Derby Company." Mr. Smith referred to an interview which a deputation from the Town and Trade Association had had with the Directors of the Belper Company, and maintained that the shareholders would not suffer if the Derby Company extended their mains to Belper, while the town would benefit both in regard to the price and quality of the gas. The Chairman (Alderman G. H. Strutt) said he did not offer a word of objection to the proposal. As the owner of a gas-works, he had not found the manufacture of the commodity either fascinating or lucrative. If anyone wished to buy him out on reasonable terms, he should be quite willing to sell. All he wanted to know was whether it would be for the benefit of the town. The resolution to invite the Derby Company was unanimously carried; and the Council were formed into a Committee to go into details.

Walker and Wallsend Gas Company.

The Directors of the Walker and Wallsend Union Gas Company, in their annual report, state that the revenue for the past year amounted to £41,313, and the expenditure to £30,194; leaving a profit balance of £11,119. Adding this to the balance of undivided profits brought forward, there is a sum of £15,120 available for distribution, which the Directors recommend should be appropriated as follows: Interest on mortgages, reserves, &c., £2040; depreciation fund, £500; and insurance fund, £1000. The interim dividends to June 30, 1906, were: Preference stock at 5 per cent. per annum, less income-tax, £285; ordinary 3½ per cent. stock, at £4 17s. 6d. per cent. per annum, less income-tax, £2744; ordinary 5 per cent. stock, at £6 7s. 6d. per cent. per annum, less income-tax, £363. The dividends for the six months to December will be: Preference stock, £285; ordinary 3½ per cent. stock, at £4 17s. 6d. per cent. per annum, less income-tax, £2744. This will make the ordinary 5 per cent. stock, at £6 7s. 6d. per cent. per annum, less income-tax, £666, a total of £10,628, leaving £4492 to be carried forward to next year's account. It is, the Directors remark, very satisfactory to state that the revenue account for the year gives an increase in gross profit, as compared with the previous year, of £2165. There is an increase for 1906 in the sale of gas of 6·35 per cent., and in the number of consumers of 6·71 per cent. The total number of consumers now reaches 10,480. The capital account for the year shows an additional expenditure of £17,942, which has been met by the issue of £10,000 of 5 per cent. ordinary stock, realizing £13,491, or an average of £134 18s. 3·6d. per cent., and £4526 of 4 per cent. mortgage bonds. The general development of the new works at Howdon Lane has been steadily proceeded with. The new three-lift gasholder came into use in November, and is proving of great advantage. The excavations, foundations, sidings, &c., are being rapidly carried out. The Directors are giving careful consideration to the buildings and manufacturing plant; and to meet the additional outlay a special meeting will be held at the close of the ordinary meeting next week to authorize the raising of further capital. The Gas Companies (Removal of Sulphur Restrictions) Act, 1906, received the Royal Assent on July 20; but the Directors have not as yet altered their mode of purification, owing to limited space.

THE "BLAND" LIGHT IN CHURCH.

ACTUAL FACTS

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ROSS.

4th Jany 1907

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Yours Sincerely
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Churchwarden Ross Parish Church

Xmas Qr. 1905
Naked Burners 65,200

Xmas Qr. 1906
Bland Light 31,800

33,400.

During the whole of this past quarter we have not removed a single mantle or globe.

Yours faithfully
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Bude Gas Bill.—The Stratton and Bude Urban District Council, at their last meeting, had under consideration a report by the General Purposes Committee on the Bill which is being promoted for the supply of the district with gas. The Committee instructed the Clerk to write to the Parliamentary Agents (Messrs. Baker and Co.) to ascertain the names of the promoters, the amount of the capital, and other particulars with regard to the proposed undertaking. He was also instructed to ask whether provision could be made giving the Council the option of purchasing the undertaking at the end of twenty years, on the basis of the profits of the preceding five years, as determined by arbitration. Inquiry was also made as to the question of street lighting and the establishing of a testing-station if the Council should wish to have one. The Council have since held a private meeting to consider the reply of Messrs. Baker and Co.

Cushendall (Co. Antrim) Water Supply.—Mr. A. D. Price, one of the Inspectors of the Local Government Board for Ireland, recently held an inquiry into an application by the Ballycastle Rural District Council for sanction to a loan of £1928 for providing a water supply for Cushendall. Dr. M'Larnen, formerly Medical Officer of Health for the village, gave evidence as to the supply of water being only two wells, both of which were totally unfit to be used for drinking and domestic purposes. Mr. T. J. O'Neill stated that he had been instructed by the Council to prepare plans for the water and sewerage scheme for the village. There was no chance of contamination. Objection was raised to the scheme on the ground of its being too expensive for the place; but it was stated by the Clerk to the Council that it would entail a rate of only 3d. or 4d. in the pound.

Dissatisfaction with Electric Lighting at Acton.—In the course of a Local Government Board inquiry, conducted by Mr. H. R. Hooper, M.Inst.C.E., held on Friday at the offices of the Acton Urban District Council, into the application of the Council to borrow an additional £20,000 for the purposes of their electric light undertaking, Mr. A. V. Palmer, the Hon. Secretary of the Acton Ratepayers' Association, said this body had from the very first been against the Council purchasing electricity in bulk. Their agreement with the Metropolitan Electric Supply Company, Limited, was such that the scheme could never be made a financial success. As to the scheme itself, it was known locally as "the light that failed;" and the ratepayers regarded it as a scandalous waste of public money to have substituted such a poor light in the main road for incandescent gas lighting, which was far superior.

Hartwell Water Supply.—Last Wednesday, the village of Hartwell, which is within the jurisdiction of the Potterspury (Stony Stratford) Rural District Council, was furnished with a water supply, at a cost of about £1100. Two springs were known to exist about a mile from the village, and by means of the divining-rod their course was traced by Mr. J. B. Fairchild, the Surveyor to the Council, until a spot was reached just above where they met. Here a well was sunk to a depth of 33 ft. 8 in., and a plentiful supply tapped in the dry season. After the well had been pumped continuously for fourteen days (6000 gallons per hour being yielded), a wind-engine capable of raising 400 gallons every hour to a height of 150 feet was erected on steel towers 30 feet high, and the water pumped to receiving-tanks just above the village. Their storage capacity is 15,000 gallons, and allowing six gallons per head per day, and taking the population at 400, the tanks when full will hold six days' supply. From the tanks, the water flows by gravitation into ten stand-pipes distributed through the village. The works, which were commenced last October, were designed by Messrs. W. J. Treadwell and Son, of Middleton Cheney.

Improved Relations at Sidmouth.—Presiding at the annual meeting of the Sidmouth Gas Company, Mr. Thomas Douglas, the Managing Director, pointed out that the past year had been very successful, and the increase in the consumption of gas continued in a satisfactory degree. The dividends paid for the year were 7½ per cent. on the preference shares and 10 per cent. on the ordinary shares; and there was a balance of £1258 to carry forward. Under the agreement which had been entered into with the District Council, the Company would carry out the public lighting for a term of five years. Many of the lamps would be fitted with incandescent burners; and the arrangements would, he thought, be found satisfactory to the Council and to the Company. The works were in an improved condition, and the new regenerator furnaces were a source of economy. The leakage was still too much; and though some means had been adopted to reduce it, there was not much prospect of success in this direction so long as the Council used the present heavy steam-roller. Dr. Pullin congratulated the Chairman on the termination of the controversy which had disturbed the relations between the Company and the Council. He considered the new lights already put up, under the agreement with the Council, were a great improvement. The report was adopted.

The Water-Finder's Gift.—At a recent meeting of the London Spiritualists' Alliance, Professor W. F. Barrett, of Dublin, whose name will be remembered by many of our readers in connection with his investigations into the nature of the water-finder's power of divination, delivered an address on the subject. He said "dowsers" were to be found in all ranks of society, and though they were very well known in the south-west of England, they were not confined to that part of the country. They were known throughout the whole of the civilized world. In Somersetshire, a property owner would as soon think of planting a tree with its roots upwards as of sinking a well without employing a diviner. Frequently these people were of the labouring class, ignorant of all science; but the President of the Cornish Geological Society was a dowser. Lord Farrar, again, was a capital one, as also was Mr. Andrew Lang. Dean Ovenden had discovered, to his amazement, that he, too, was a water-finder. Children had the dowsing power, and women as well as men, girls as well as boys, possessed it. Electricity had nothing to do with the phenomenon, he was certain; nor had any radio-active power. The cause was not a physical one—it was psychical. What was it, then? It was an instinct, or gift—a sort of clairvoyance. A dowser was a person who, unconsciously to himself, was able to perceive the presence, not only of underground water, but of anything that he was set to work to seek, such as a buried treasure or a mineral lode; and, as he had proved, the sensitiveness of the dowser was stronger when the subject was hypnotized.

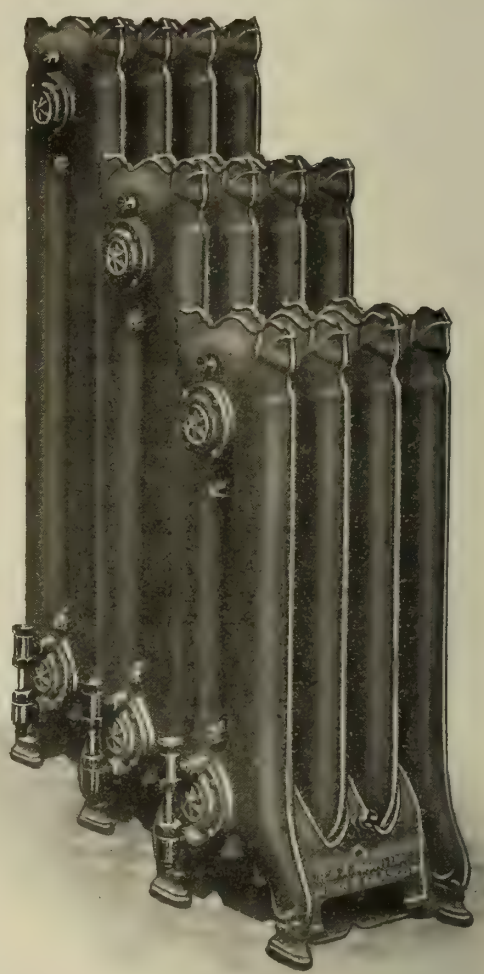
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Mr. W. A. Schultz, F.C.A., the Secretary of the Ascot District Gas and Electricity Company, and Director of other Gas Companies, has been appointed a Justice of the Peace for the County of London.

The Holmfirth Urban District Council have appointed a deputation to meet the Directors of the local Gas Company for the purpose of discussing with them the subject of the sale of the undertaking to the Council. The Directors were asked to name a time for the meeting.

The Pembroke district of Dublin suffered some inconvenience owing to the break in two places of a 24-inch water-main while under test. The tram-lines were flooded, and pedestrians were naturally put to some trouble. However, the authorities were soon communicated with, and the water turned off.

The Derby Gas Company, on the recommendation of their Engineer (Mr. J. Ferguson Bell), have placed a contract for six settings of eight through retorts each, on the deep regenerative principle, with Messrs. F. C. Sugden and Co., of Leeds. The regenerators are to be fitted with Hudson's patent producers.

The Gas Committee of the Coventry City Council have resolved to make a grant of £200 to Mrs. Howarth, the widow of the man killed in the accident at the gas-works last July—provided that this £200 is added to the £300 which Mrs. Howarth has received from the Insurance Company, and the joint amount placed in trust for the benefit of her and her children, under a trust deed.

Last Wednesday morning, the 36-inch water-main of the Liverpool Corporation burst at Huyton. The force of the water carried away a large quantity of the roadway and swept away the footpath for some distance, depositing it on to the road and completely blocking the tramway track. A number of Corporation workmen were soon on the scene removing the *debris* and repairing the damage.

By an announcement which appears elsewhere, our readers will see that the Directors of the Norwich Water Company are inviting tenders for 500 ordinary £10 shares, at a minimum price of £16 5s. each—being part of the capital authorized by the Company's Act of 1904. The shares will be issued as fully paid, and be entitled to a maximum dividend of 6 per cent. Tenders are to be sent in by the 22nd prox., and the dividend will accrue from the 6th of April.

From an announcement which appears elsewhere, our readers will see that the Saxmundham Gas Company, Limited, are issuing 3500 cumulative preference shares of £1 each, entitling the holders to a dividend at the rate of 5 per cent. per annum from the date of payment. The Company has been formed, with a capital of £5000, to acquire the undertaking of the Saxmundham Gaslight, Coal, and Coke Company as a going concern, and the vendors will take the 1500 ordinary shares in part payment of the purchase money.

While two men from the Nottingham Gas Department were examining the meter and fittings at a house from which a complaint of an escape had been received, there was a violent explosion; but fortunately the men, and the inmates of the house, were not injured. A staff of men from the gas-works were quickly on the scene; and it was ascertained that the cause of the accident was a leakage in the main in the street—the gas having found its way by the service-pipe into the house and accumulated under the floors, thus causing the explosion when a match was struck.

The Directors of the National Gas-Engine Company, Limited, in their report for the past year state that the net profit, after deducting ample depreciation on buildings, tools, &c., and allowing for trade expenses and management salaries, is £46,143. After providing dividends on the preference shares and adding £5067 brought forward from last year, they propose to pay a final dividerd at the rate of 20 per cent. per annum on the ordinary shares (making 20 per cent. for the year), leaving £20,674, out of which it is proposed to place £10,000 to the reserve fund (making it £70,000) and carry forward £10,674.

The Stirling Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a new retort-bench, consisting of ten settings of eight retorts, on the regenerator system, complete with all foundations, subway floor, retort-mountings, foul main, governors, tar-towers, and Everitt's patent tar-extractor. The contract also includes complete coal-handling plant, with breaker, elevator, conveyor, and continuous overhead hoppers, and one of Messrs. Robert Dempster and Sons' combined charging and discharging machines, similar to the one inspected by Mr. J. D. Smith, the Gas Company's Engineer, at the Bingley Gas-Works. The whole of the work has to be carried out under the supervision of Mr. Smith.

The outdoor staff of the British Gaslight Company, Limited, at Norwich, last Friday week sat down (to the number of about 130) to a dinner which it is hoped to make an annual affair. In the absence through indisposition of Mr. Thomas Glover, the chair was occupied by Mr. W. H. Wayte, the Outdoor Superintendent. Proposing the toast of "The British Gaslight Company," Mr. F. Balls, the Chief Collector, spoke of the progress of the undertaking during the thirty years he had been connected with it. He said that thirty years ago the street lighting was poor; and lamplighters had to carry ladders and matches in order to fulfil their duties. Now the public lighting of Norwich was second to that of no other town—thanks to the introduction of incandescent mantles. Thirty years ago the fitters in the employ of the Company could be counted on the fingers of one hand; now they numbered sixty. In his period of service, gas cooking-stoves had been introduced; and now there were 18,000 in use in Norwich. Then slot-meters had been introduced within the last twelve years; and to-day there were something like 18,000 in the city—more than in any other town of the same size. All these changes and improvements had been effected by the former Manager, Mr. John Young, and the present one, Mr. Thomas Glover, assisted during the last three years by the Chairman that evening. Mr. V. Harston responded, and remarked that he had been told the British Gaslight Company were the only gas company who had ever been thanked by a corporation for the way they lighted the streets. The Company were very good people to work for. They gave the men every encouragement to take an interest in the business, and looked after the welfare of their employees.

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Company Meetings.

BARNET GAS AND WATER COMPANY. Albion Tavern. Feb. 22. 12.30 o'clock.
BRENTFORD GAS COMPANY. Westminster Palace Hotel. Feb. 15. 2.30 o'clock.
BROMLEY GAS COMPANY. Bell Hotel, Bromley. Feb. 19. Six o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices. Feb. 26. Three o'clock.
RIDDINGS DISTRICT GAS COMPANY. London Office. Feb. 22. Three o'clock.
SOUTH SUBURBAN GAS COMPANY. Albion Tavern. Feb. 22. Three o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Offices. Feb. 23. Three o'clock.
WEST HAM GAS COMPANY. Liverpool Street Hotel. Feb. 25. 12.30 o'clock.

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COCKERMOUTH GAS DEPARTMENT. Tenders by Feb. 18.

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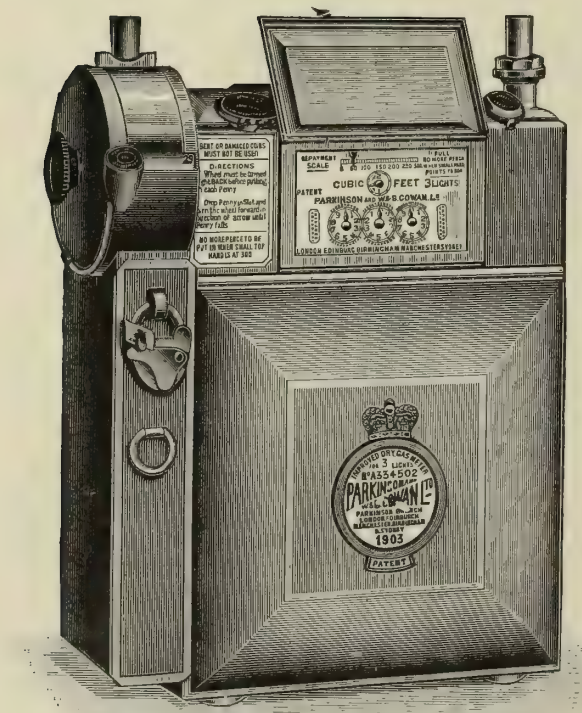
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EDITORIAL NOTES—GAS, &c.

The Growth of the Gas Industry's Business.

THE gas industry continues to withdraw itself, with substantial strides, from that incipient decay which those who are not among its well-wishers were eagerly looking for not many years since. This disinclination of the industry to comply with the hopes and prognostications of those who are inimical to it, will have been patent to all who have had an opportunity of investigating the particulars that were quoted in last week's "JOURNAL" from the Board of Trade returns relating to the gas undertakings that work under statutory authority. The returns refer in the case of Companies to the year ending December, 1905, and in the case of the Local Authorities to the year ending March 25 last. The figures denote an exceedingly satisfactory progressiveness. Taking the totals, there is only one that shows a setback, and that is the item of receipts. Important as receipts are, the decrease, scattered over 752 undertakings, is comparatively small; and what has been the industry's loss in this single respect has been, in considerable measure, the consumers' gain. And in view of the increased business that has been done, at lower prices than formerly, the gain of the consumers cannot possibly be represented by the concrete figure of difference between the income of the year and that of the previous one. Lower market values for certain residuals also, no doubt, have had a partial effect on the receipts. Anyway, a reduction in the total income of the industry has been a rare occurrence in the past twenty years. There has only been before, in that period, three such happenings in the case of the Companies; and only one in the case of the gas-supplying Local Authorities. The last time a decline in aggregate receipts occurred followed upon the general reductions in price when the financial position was being recovered after the great upward flight of the coal market in 1900-1. On the present occasion, it is the Companies alone who have shown a loss in receipts; the Local Authorities having improved their position. An explanation would be interesting. The total income of both classes of undertakings was £27,253,705; being a diminution of £121,849. The Companies, however, had a reduction of £211,274; but the Local Authorities an increase of £89,425. That the decline is not due to any recession in the Companies' business is adequately witnessed by the fact that their advance in gas consumption during the year is represented by the healthy stretch of figures, 3,593,290,000 cubic feet, which compares with 2,234,710,000 cubic feet of the Local Authorities. These figures are not put into juxtaposition for the purpose of showing superiority; but for the sole object of indicating that lessened income has not been produced by a lessened business in gas.

All the remaining total statistics also declare that the vitality of the gas business has been in nowise impaired; and, taken as a whole, growth is luxuriant, and quite in accordance with desire. There are nineteen additional concerns, all relatively small, which are included in the returns by transfer to local authorities from private ownership, or through being just endowed with statutory powers. But the incorporation of these does not make any great impression—as greatness is measured by such totals as those we are dealing with—on the increases. However, the capital invested in the gas-supply and bye-products businesses at the dates to which the returns are made (£124,184,221), shows an increase of close upon £3,000,000. The industry's revenue has just been dealt with; and as to the working expenditure of £20,496,017, there is an increase of £45,816—due to the larger business done, and such additional calls on the undertakings as are imposed by higher rates. The bulk of coal carbonized was raised to 14,480,325 tons by an addition of 184,723 tons. The quantity of gas made (including water gas) was 174,904,791,000 cubic feet, or an increase of no less than 6,257,115,000 cubic feet; and the quantity sold was 161,407,725,000 cubic feet, or an advance of 5,828,000,000 cubic feet. These figures illustrate abounding prosperity; and yet they do not exhaust the illustration. But sticklers for accuracy will be curious to know how much of the augmentation of business revealed by the returns is accounted for by the fresh introductions. The extension of the figures that they have produced is over-represented by 450 million cubic feet; so that the real increase in business was approximately 5400 million cubic feet. Regarding water gas, the increased output was not one-fifth of the additional consumption of gas—the total make of water gas being 19,736,859,000 cubic feet, or an increase of 984,359,000 cubic feet. The business in acetylene gas in the Banffshire town of Portsoy appears to be standing still, if not slightly diminishing, seeing that the consumption in the period covered by the returns was 101,250 cubic feet, as against an estimated consumption the preceding year of 103,500 cubic feet; the respective quantities of carbide of calcium used being 11¼ and 11½ tons.

There is a vast amount of interest to be extracted from the returns by anyone having a fancy for statistical investigation. For instance, it is found that, taking the past ten years, the average annual increase in consumption (including the new undertakings) is 4,996,402,300 cubic feet; so that the increment for the past year of 5,828,000,000 cubic feet is well above the average. Incidentally, it may be noted that the increased consumption during the ten years has been 49,964,023,000 cubic feet. The improvement made in the carbonizing returns is also disclosed by taking the comparative figures at the beginning and the end of the decennial period. The total quantity of coal carbonized in the twelve months covered by the present returns was (as previously stated) 14,480,325 tons; while ten years ago it was 11,937,446 tons—being an increase of 2,542,879 tons. Dividing the output of gas in these returns (155,167,932,000 feet, after deducting water gas and acetylene gas) by the coal used, we have an average make per ton of 10,715 cubic feet; and dealing the same with the output of ten years ago, the production per ton was then 10,171 cubic feet. This is distributing credit broadcast for improvement in working; but it is common knowledge that many undertakings have not enriched their carbonizing records, while others have mounted up to far superior figures than the 10,715 cubic feet shown here. At any rate, to have got so near to an average production of 11,000 cubic feet per ton, is a good index to the progress in the adoption of improved carbonizing plant and method.

Reverting to the comparisons with the year preceding the present returns, it is seen that the consumers (numbering 5,064,075) increased by 326,898. Now looking back again ten years, it is found that the augmentation has been in the decade 2,404,304. The consumers supplied per mile of main has also bounded up from 111·4 to 163·3, notwithstanding that the increase in the mileage of main in the interim has been 7074. The number of public lamps supplied was, up to the dates of the last returns, 665,791—an increase in one year of 11,608.

One among many other interesting points concerns recent small purchases of undertakings by local authorities. It is seen that in the year covered by the returns Chard incurred, after meeting interest and sinking fund, a loss of £612; Rickmansworth a deficit of £658; while Omagh paid their interest, but set nothing aside for sinking fund, and then only had a balance of £27. It is vain, in some districts, for local authorities to strive to emulate those local authorities, with populous areas, who purchased their gas undertakings before the great spurt in business produced by the prepayment system, cooking and heating stoves, and the extension of the use of gas for industrial purposes.

This last paragraph can pass without further comment; the deficits themselves tell their tale. Omitting it, therefore, from consideration, the several calculations that precede

show, with the emphasis of largeness, the industry's unflagging progress; they indicate more and more the expansion of service and appreciation; and several of them are significant of the consideration shown to consumers. The gas industry, excepting in a few sluggish quarters, knows its own business. It may also be submitted to those holding the doctrine that civic management is the best that, if private gas enterprise exhibited the supineness to public requirement that is so often advanced, it would not make the substantial progress that is presented in these returns, but, on the contrary, would assuredly reap the reward of well-deserved retrogression.

Commercial Gas Company's Accounts.

The financial result and business accretion of the past half year's working will both be pleasing to the proprietors of the Commercial Gas Company. The Company have again shown great animation in their prepayment meter and stove departments. Looking at the accounts for the corresponding half of 1905, it is found that they have only missed by 256 attaining the good round figure of 10,000 new prepayment connections in the year—the total now being 54,968. The rental (not including gas) derived from this source in the half year was £12,042, or an increase of £2127. Stove connections also, by an addition of 6782, have risen to 45,119; and the rental from this source also shows an improvement of £1133—the total being £7202. The ordinary meters number 24,257; and the rental from them amounts to £2878. From these figures, it will be gathered that the prepayment and stove branches have produced a tremendous influence on the business of the Company during more recent times. The consumption of gas for public lights and under contract and for private lights has increased by 55¼ million cubic feet; and the gas receipts for the past half year are £189,898, or an increase of £5270. Considering the character of the half year in heat and light, this gain is excellent; and it is fairly certain that prepayment and day consumption accounts for it. Ratepayers in the Company's district have evidently been obtaining advantage in connection with the public lighting, seeing that the receipts from public lamps (£5946) are £935 less than twelve months since, while the number of lamps have only diminished by 18. Regarding residuals, coke and breeze show gains; but tar and ammoniacal liquor are not quite so good by a few hundreds. However, the total revenue was £260,789; being an increase of £9416. As might be expected, coal and oil are responsible for an increase of £8629—the total cost having been £91,519; but the variations in the other items under the head of manufacture cancelled the increase, with the exception of £942. But, in connection with the increased cost, it is noticed that the Company carbonized 1757 tons of coal less; but they have, judging by the information afforded (including the fact that an additional 21,432 gallons of oil were used), been making rather more use of their carburetted water-gas plant. But considering the smaller quantity of coal carbonized, the increase in the consumption of oil and the other statistical information presented, are not sufficient to account for the extra 56,737,000 cubic feet of gas that was produced; so that, at the meeting, the Chairman will probably have something to say about improved carbonizing returns. The only other item that specially attracts attention in the revenue account is the item of rates and taxes, which, standing at £13,184, is up by £2569. In the result, the total expenditure is £196,263, or an increase of £5920. The balance carried to net revenue account is £64,526, and this is an improvement of £3496. The same dividends of £5 4s. and 5 per cent. are recommended. The Chairman, at the meeting on Thursday, will not, so far as can be seen, have anything startling to tell the proprietors; but he will have no difficulty from the figures in proving to them that they are in possession of a comfortable and growing business, though serving to large extent a working-class constituency.

Industry and Municipal Socialism.

In the turmoil of the County Council election campaign in London the thoughts cannot be restrained from consideration of the important influence the result of the election will have upon the welfare of private enterprise—not private enterprise as represented alone by individual and joint-stock industry within the Administrative County of London, but private enterprise as so represented throughout the length and breadth of the country. During the *régime* of the Progressive-Socialist majority in the County Council, the Spring Gardens Council Chamber has been the birthplace of many wild schemes; it has been the source from which a debt out of all proportion to the growth or the requirements of the population of London has mounted up, and it has produced for the ratepayers of London an embarrassing financial responsibility. London has dismissed a considerable part of the Progressive-Socialist combination from the business of the Borough Councils; and very serious work is now being done to further stop their spendthrift course, by relieving them of power in the County Council. But should, unfortunately, the issue be the disastrous one for London of the continuation in authority of the Progressive party with its socialistic propelling power, that issue would, we say deliberately, also gravely affect industry throughout the country. Stimulated and encouraged by the success in London, the Socialists, Collectivists, or by what other name men of the same stamp chose to be known, would fiery-footed revive with strong force the war against private enterprise, and urge for its earliest possible sacking.

In the Metropolis just at the present time, no word is sufficiently hard or bitter to apply to private enterprise; it is a corrupt thing that merits no man's respect. And the Progressives, with their Socialistic collaborators, are—or one or other of the sections of the combination are—asking for the municipalization of everything. Electricity, gas supply, coal, docks, bread, milk, and we know not what. Seize everything in fact, even to the burial grounds that are under private ownership. On the platform, the question of municipalizing the London gas supply has been glided over; perhaps it is thought that is too big a pill to ask the ratepayers to swallow in conjunction with the electricity scheme, which the Municipal Reformers hope to have the pleasure of repudiating, and laying to its final rest. But Mr. John Burns, in his best Napoleonic style, has indicated that he would have no hesitation in roping-in the gas supply with the other public services to be administered by the County Council. "The municipalization of great undertak-"ings like tramways, electric light, gas, and water in this "country has," he said in his Queen's Hall speech in setting the Progressive ball rolling in the election campaign, "led "to a reduction of the rates. By municipalizing these "matters, which in other countries are the monopolies of "employers, we have removed a fruitful source of corrup-"tion and danger such as beset the Anglo-American com-"munities." These being his views, what he would think of the municipalization of the gas supply of London cannot be open to question. We fail to find, however, that the Companies controlling the gas supply are a "fruitful source of "corruption and danger." Mr. Burns, when speaking, had probably so much else on his mind that he inadvertently overlooked the fact that the modern history of civic administration in the Metropolis has brought to public knowledge the existence within it of certain hotbeds of corruption and danger. But of the fact, in his quiet moments, he is cognizant. And still he garbs in spotless white Metropolitan local administration, but accuses the administrators of private enterprise of "jobbery and robbery." Thus does extreme partisanship obscure vision, even of a man of Mr. Burns' power of observation. Let us have fair argument and not abuse from those who are demanding that the productive and distributing industries of London and the Provinces should be vested in public authority, and who, if they obtain supremacy in power, will at once attempt to give an almost immediate corporeality to their theories and ideals. The Municipal Reformers of London hold—and we hold with them—that nothing would be more fatal to the country's commercial power among the nations of the world, and that nothing would be more fatal to the financial security of London, than the subversion of private enterprise and of individual effort, and the setting up in its place, and on a foundation of public finance, of a heavy cumbrous system of management from which individual responsibility, the competitive and creative activity of brains, and personal financial interest—the main impellents in commerce—are entirely absent.

The Progressive-Socialist majority of the County Council have not proved by deeds their efficiency in the management of vast and specialized enterprise; and therefore we are hoping that the coming election will give the death-blow to the ambitious scheme of the at present dominant party for taking in hand, backed by the rates, the entire electricity supply of London and the districts for many miles around. It was Mr. Haldane who the other week, in addressing the British

Science Guild, was dilating on the need for scientific guidance by practical men to produce efficient action. The County Council, as an administrative body constituted as it now is, and as it will be (no matter which party wins the greater authority), cannot possibly have for every form of legitimate administrative work, as well as for every form of productive and trading work that the Municipal Socialists desire to take under their wing, those scientifically-guided practical minds that are necessary for efficient action. To be scientifically guided, or to even dream of being practical, would be repugnant to the mind of the London Municipal Socialist, whose self-esteem really knows no bounds. Their trading work of the past shows it; their schemes for the future are incontrovertible confirmations. For the trading work that has not been successful, they plead for further time, and greater waste of the ratepayers' money. The Council, says Mr. Burns, can no more help the want of success of some of their schemes than the chimney sweep can help the decline in his trade through the growing popularity of the gas-stove. Such a comparison is ill-chosen. Chimney sweeps once thriven because there was a demand for them; some of the Council's schemes, in whole or in part, have not thriven because there has never existed the necessary demand for them to yield compensation and justification.

If one wants to know what high finance really is in local administration, under the benevolent handling of the Progressive Socialists, he should read the book by Mr. John Holt Schooling, entitled "London County Council Finance." There it is seen that the total liabilities of the Council are £74,513,703; the estimated total assets, £29,279,505; and the net debt not otherwise provided for than by future yearly charges for redemption of the debt, £45,234,198. The yearly cost of the interest on the debt has now reached £2,324,000, or nearly £45,000 a week. The estimated receipts on rates account this financial year (including 3 millions the produce of the education rate) is 10 millions, or approximately £190,000 a week; and the estimated expenditure on rates account is £10,106,643, including calculated deficiencies (amounting to £57,911) in revenue producing undertakings. The general *plus* the special rates of the Council were £453 per 1000 of the population in 1890 and £645 in 1907. We are told the men who have been running riot (we do not say all the Council's work has been badly done) among the funds of the ratepayers are "splendid "fellows, with dedicated lives." It will be a fine thing for London and elsewhere if these immaculate and splendid fellows will dedicate their lives to some more useful purpose than imposing such a great and ever-growing strain on the ratepayers of the Metropolis. It is rumoured that if the Progressives and Socialists again get a majority, they are going to introduce a short Act to lengthen their tenure of office from three to seven years; so that, we take it, they may go along uninterruptedly with their grotesque schemes without the intervention of the ratepayers, which is being found so strikingly irksome just now when the Electricity Bill has been introduced. "*Finem respice*" is a motto that the ratepayers should keep well in view during the present campaign.

Co-Partnership in Practice.

Good service has been rendered by the "Standard" in bringing to the notice of the general public (by means of two very readable articles) the exact aims and accomplishments of the South Metropolitan and South Suburban Gas Companies' co-partnership schemes. Of course, those connected with the gas industry are perfectly well acquainted with the matter by this time; but there are doubtless still a large number of other people who understand imperfectly (if at all) the system which has led to these two Companies being regarded—and justly so—as model employers of labour. While so much Socialism is being talked in certain quarters, it cannot possibly do any harm if means (which have been tried and proved workable in practice) are indicated whereby working men may be prevented from becoming the disciples of those who preach this doctrine. The articles to which we refer were written by Mr. L. Cope Cornford, who acknowledges his indebtedness to Sir George Livesey for enabling him to fully investigate the schemes. An explanation of the sliding-scale is followed by the story of the South Metropolitan strike, which arose over the introduction of the original profit-sharing arrangement. On the collapse of the strike, the Company agreed to fill up vacancies with Unionists; but, on the Secretary of the Union declaring that in future the mistake of giving a week's notice would not be repeated—the men would be called out without any notice at all—the Company, in the interests of the consumers, declined to employ Union men. In the case of the South Suburban Company, however (whose co-partnership scheme came into operation some years later), the men were told that they were perfectly free to continue to be members of the Gas Workers' or any other Union; and it is stated that the Union men have come to accept profit-sharing —"disregarding their leaders." The second article deals with the results of the system and its advantages; and what pleasant reading this makes, "JOURNAL" students can well understand. The author concludes with the following recognition of Sir George's efforts to promote the welfare of the employees: "It is not for the present writer to affirm that in the principle so admirably fulfilled in Sir George Livesey's noble achievement lies the sovereign remedy for the present distress; but it would seem at least to be worthy of a very careful consideration. The theory of co-operation is not, of course, new; but the honour of having given the world a signal example of its successful application to a great industrial concern belongs to Sir George Livesey."

Manufacturers and the Rates.

The question of whether the position occupied by corporation stocks, from an investment point of view, has been affected to an appreciable extent by the large capital expenditure of local authorities during recent years, is one that has at different times been keenly debated. Of course, prices have lately been considerably depressed; but this has applied also to other first-class securities, and has not by any means been confined to any one particular branch. There have admittedly been causes for this, quite apart from any considerations of municipal policy; but in a leading article recently, which dealt with the subject of manufacturers and the rates, the "Financial Times" pointed out that, beyond the general factors operating, there were in the case of corporation stocks particular causes tending to a decline in price. "Extravagance in management," it is said, "and continual piling up of debts, especially on trading or semi-sentimental projects, have certainly tended to reduce the credit of several local authorities, while recent revelations with regard to a particular borough have produced anything but a reassuring effect, though these may happily be regarded as quite exceptional. For the first time, indeed, in many years, a shade of suspicion has been cast on the security for municipal indebtedness." While saying this, however, our contemporary does not suggest that at present there is any real reason for uneasiness, but that if municipal borrowing be renewed on a large scale (as there is some indication that it may be) the position will have to be very carefully considered. As showing how the need for caution may arise, attention is drawn to the fact that manufacturers are now exhibiting a very decided tendency to avoid large towns, and seek the advantages of cheap land, low rates and taxes, and freedom from irksome building restrictions and prosecutions for nuisance, which are to be found in the country or in the neighbourhood of small towns. When this policy is carried so far as to entail the removal of existing factories, as has been witnessed in several places of late, the result must, of course, be directly felt by the towns which are thus deserted. Our contemporary says that the mobility of industries was hardly taken into account by the men who built up our huge municipal expenditure; but there are signs that these long-suffering ratepayers are taking steps which may eventually lead to the slow decadence of some large manufacturing towns. It is argued that, with such changes within the bounds of reasonable possibility, the borrowing by municipalities should be very carefully watched; "and it may before very long be desirable to carefully discriminate between the credits of various bodies"—which is already done to a limited extent in the market quotations.

The Work of the National Physical Laboratory.—The Board of Treasury have appointed a Committee to inquire generally into the work now performed at the National Physical Laboratory, with special reference to the character of the tests undertaken there and the lines on which any further development of the work of the laboratory should proceed. The Committee will consist of the Right Hon. G. W. Balfour (Chairman), Sir Andrew Noble, Bart., K.C.B., F.R.S., Mr. W. J. Crossley, M.P., and Mr. R. Chalmers, C.B. Mr. G. C. Upcott, of the Treasury, will be the Secretary to the Committee.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 423.)

AGAIN we have to chronicle no improvement in the general position of things on the Stock Exchange. Business was, if anything, a little quieter than ever, and pretty well every department was terribly dull and flat. On Tuesday, after a gloomy opening the previous day, there was a little promise of amendment. But it soon degenerated into an irregular shifting of ups and downs; and when this had ceased, the downs had it all their own way. It was not the American Market last week that lowered the tone, but a sort of persistent depression, which seemed to affect markets without just cause. Movements of gold were at the bottom of it to a certain extent. The Money Market opened easy with a good supply. But rates began to stiffen after a while; and before the close a shortage was apparent. In the Gas Market, after a fair opening, business became much quieter; and so it continued to slacken, until it became dead-quiet on the closing day. Changes in quotation were few and slight. Having regard to the quantity of excited talk about coal which has appeared in a portion of the Press during the week, and which was almost enough to make people imagine the country is on the brink of a coal famine, it would not have surprised one if timid holders of gas stocks had rushed to realize, and so forced down quotations. As a matter of fact, however, out of six changes in price, three are rises and three are falls. In Gaslight and Coke issues, the ordinary receded a point—stock changing hands at figures which ranged from 98½ to 96½. A fair amount of business was marked in the secured issues, considering the general quietude all round; and prices were unchanged. The maximum was done at from 91¼ to 90; the preference, at from 108 to 109½; and the debenture, at 84½ free. South Metropolitan was a point easier upon the unsatisfactory report for the half year; but there was very little business done in it. Transactions ranged in price from 128½ to 127. The debenture was done once at 85½. Commercials—which appear from the accounts to have had a good half year, earning their dividend and a nice balance over—were very little dealt in; a couple of bargains in the 4 per cent. at 111 and 112 being the total for the week. The Suburban and Provincial group was hardly dealt in at all. British was done at 42¼, Southampton at 110⅜, and West Ham preference at 123¾ (the quotation advancing a point). On the Liverpool Exchange, Chester improved 1½. The Continental Companies had moderate business. Imperial was adversely affected; transactions drooping from 184 to 181—a fall of 1 in the quotation. Union marked 124, European fully-paid 24½ and 24⅝, and ditto part-paid from 18 to 18½ (a rise of ½ in the quotation). Among the undertakings of the remoter world, Buenos Ayres was marked at 11⅞ and 11⅝, Primitiva at 7⅞, ditto preference at 5 13/16 and 5 11/16, ditto debenture at 95¼, River Plate at from 12⅝ to 12¾, ditto debenture at 96, Monte Video at 12, San Paulo at 13 5/16, and Oriental at 151.

The closing prices are shown in our list on p. 423.

ELECTRIC LIGHTING MEMORANDA.

Public Lighting plus Shop Lighting in Oxford Street—Cost of the Flame Arc Installation—The Danger of Central Standards—New Lamps from America: The "Helion" and an Alloy Filament—Reduced Dividends and Market Values.

OUR electrical friends are highly delighted with the illumination of Oxford Street by the central flame-arc lamps. In their opinion, it is the very *ne plus ultra* in public lighting. But we still claim that, if the Gas Company had been allowed to carry out the lighting in accordance with their tender—not in accordance with the "previous inferior gas lighting" with which comparison is made—there would have been seen a street uniformly lighted, even after the shops were closed and all through the night, at a less cost, with all expenses for the respective lights properly and completely taken into account. Before the shops are closed, Oxford Street presents a striking scene; so it does after the shops are closed; and so it does again half-an-hour after midnight. Oxford Street is unmatched in London in the elaborate character of its shops, and in the extent of the shop-lighting arrangements regardless of expense. Such extensive lighting arrangements—whether by incandescent gas or electricity—supplementing any modern incandescent gas lighting or flame-arc system for public lighting, would make any street during the evening hours look remarkably brilliant. The public lighting of Oxford Street that the electricians are so applauding is therefore the public lighting *plus* the shop-window lighting; and if the cost of getting a similar effect could be computed, street lighting authorities would be frightened of electricity for evermore. If anyone does not believe that it is the shop lighting that contributes largely to what the electricians claim for the new flame-arc lamps, and to the making of the footways and roadway look more cheerful than they otherwise would be between the tall central standards, let that Thomas turn into St. James' Street, Piccadilly, where he will find a few centrally placed flame arc lamps unassisted by shop lighting of the lavish kind that exists in Oxford Street.

As a matter of fact, Oxford Street, judging by the old-fashioned gas-lamps that formerly disgraced it (only £550 a year being spent upon the lighting) before the Marylebone Borough Council decided upon improvement, might, so long as the shop lights did not fail, almost as well remain unlighted by street-lamps. But after the shops are closed, then and then only is properly seen the part that the flame-arc lamps play in the lighting of the thoroughfare. We get, as in St. James' Street, splashes of great brilliance close to the lamps, and shade between; and the effect is deepened by a few very ugly shadows across the road after 12.30, when, for the sake of economy, half the lamps are extinguished. Some dense shadows are also thrown in the side streets. The new lamps—and they will not always remain new—are placed at a height of 25 feet in the air, and are said to possess an illuminating power of 1500 candles each. The latter claim may be taken with a big pinch of salt. If it is 3000-candle power that is obtained from the double-lamped columns, then we are losing knowledge of what candle power is. But whatever the illuminating power, the height at which the lamps are necessarily put—to avoid eye irritation, and to get the best distribution possible from lamps not well adapted for distribution—ought to convince anyone that the ratepayers are not getting in illumination the value that they are paying for. No one wants to climb into the air to enjoy the illumination that is being wasted above; and those ordinary mortals who are content to use the footways, if they know anything of the relation of light to the law of inverse squares, will be aware that the greater distance a light is from a given object, the less the amount of light impinging upon that object—the reduction being in inverse ratio to the square of the distance. Therefore a very large proportion of the £20 13s. 7d. spent annually on each lamp (or double that sum for the two-lamped columns) must, according to that law, be dissipated where it is absolutely without value.

The price charged per lamp or double lamp does not include the capital spent upon the installation. For that expenditure the ratepayers have had to make immediate provision. The initial cost alone has been in excess of the Gas Company's tender for improved lamps by something like £4500. Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, in a letter to the "Electrical Review," states that the installation cost of the arc lamps was estimated at over £3400, with an additional £3000 for mains; while the inclusive estimate for gas was well under £2000. Taking this capital expenditure into consideration, remembering too that one-half the lamps are extinguished soon after midnight (if the same thing had been proposed in connection with gas, it would have made a difference of £200 a year), and considering also that the Borough Council have not regarded this as a "commercial transaction" as did the Gas Company in submitting their tender, it cannot with any truth be said that the relative costs of electric and high-power incandescent gas lighting are in any way demonstrated by the flame-arc lighting of Oxford Street. The estimate for lighting by improved gas-lamps was £1680; the charge for the 81 arc lamps is £1675; but before the Gas Company's tender had been made public, the Electricity Committee hadsubmitted a quotation of close on £1800. If the whole capital expenditure of £6400 is going to be cleared off immediately, adding the cost of £1675 for lighting, the expense of this flame-arc lighting in Oxford Street this first year will be £8075, or £673 per month! On these points, Mr. Goodenough's letter on p. 419 should be perused. Taking a perspective view of the thoroughfare, the high-placed coloured flame arc lights, with (in most cases) two on central columns, have a very showy appearance to the eye; but we do not agree that, after shop-lighting hours, this is a good example of what street lighting should be at the price that is being paid for short-hour lighting, even if we exclude the heavy initial cost. The best thing the electricians can do is to pray—and pray fervently—that no serious accident may occur through the centrally situated columns, and that the machinery at the Borough Council's generating stations may decorously comport itself, so that the whole of Oxford Street may not be submerged in utter darkness, as were the shops supplied by the Council twice near Christmas time.

As London gas and electricity suppliers have been made painfully aware, the new order of traffic has taken a very lively exception to street-lamp standards, even when erected on footpaths and above the road level. What motor cars, motor 'buses, runaway horses, and such like will think of the centrally placed standards in Oxford Street, is something that time alone can reveal. It would be idle to deny that standards centrally situated in roads are not more dangerous than those placed on footpaths, besides affecting freedom in the use of the road. The Manchester Corporation have been brought to an understanding as to the increased danger. There are some central electric tramway standards in the high road from Middleton to Manchester; and on July 13 last a motor car collided with one, doing damage which necessitated an expenditure of £116 for repairs. This was in summer time, yet it was given in evidence, at the Manchester Assizes the other day, that the first of the series of standards was invisible until the driver was within a yard or two of it. At the same spot, a hansom cab was previously injured; and the Corporation had to compromise the claim. In the case of the motor car, the jury declared the Corporation responsible; and the cost of the repairs is to come out of the city's exchequer. The standard, it should be mentioned, was not lighted. We opine that there will be occasions when the Oxford Street standards will not be lighted; and perhaps the Marylebone Borough Council will yet find that the initial, annual, and renewal costs are not the only ones that will attach to the central standards. If so, the estimated expense will, we fear, be a good bit out.

America is not going to let the Continent of Europe have all its own way in the invention of new incandescent electric lamps. There are busy heads and hands over the pond at work to that end; and lamps have been introduced, but with what practical effect has yet to be demonstrated. There is one fresh arrival known as the "Helion" filament incandescent lamp. The right that the lamp has to its title is rather far-fetched. The name "Helion" has been adapted from Helios, and was chosen "on account of the resemblance of the spectrum of the light from this filament to the solar spectrum." It is interesting and pleasant to know this. The lamp is the result of several years' research work on the part of Professor H. C. Parker and Mr. W. G. Clark in the Phœnix Physical Laboratories of Columbia. It is claimed by the inventors that in some respects the filaments are "quite remarkable" as they are not metallic, yet they can be operated at a specific consumption of 1 watt per candle at a temperature which is held to be very much below the temperature of metallic filaments when operated at this consumption. However, the Helion filament is composed largely of silicon, which is reduced and deposited, together with the other materials, under very exact conditions. The base which is being used at the present time is a special carbon filament, on which the necessary deposit is made. The filament is said to give a very white light, has a high luminous efficiency at the normal current density, and is (so it is declared) exceptional in the amount of overload current that it will take without breaking down. There is also the claim made (introduced by the tantalum lamp) that it is possible for the filament to fuse together when ruptured. Judging from the exact and careful conditions that are necessary in the manufacture of the filament, it looks like being a somewhat expensive article to produce; and this is confirmed by the great variation in the results of the laboratory life tests—eight tested lamps showing lives ranging between 485 hours and 1270 hours actual use. The lamps that failed first showed the greatest decrease in candle power (about 15 per cent.); while the lamps that ran the longest only suffered a diminution of approximately 3 per cent. The stated efficiency of the lamp is 1 watt per candle. From observations made up to the present time, the high efficiency of the filament appears "to be largely due to selective radiation, as the filament reaches a maximum whiteness at a comparatively low temperature, after which an increase in temperature to the 1720° point increases the intensity of illumination, but does not appear to make much change in the colour of the light. But with a carbon filament, the colour and quality of the light show a marked change as the temperature increases. Here again, with a lamp possessing so many virtues, there is disappointment for the electricians of this country. The lowest point to which it has yet been found possible to make the filaments is for 30 candles, at a voltage of 100 to 115.

An American patent has also been granted to Mr. J. A. Heany for a metallic filament lamp made of an alloy of tungsten and titanium, or of an alloy of tungsten or some other metal. Mr. James Swinburne in his recent paper did not appear to be greatly convinced that filaments composed of an alloy would be suitable for such lamps, on account of their propensity to melt at a lower temperature than either of the component metals. But this inventor states that he has discovered that certain alloys of certain metals in various proportions are very stable at high temperatures, and appear to have the properties of selective radiation in a vacuum. Here again the production of a filament, according to the description in the patent specification of the processes employed, seems to be a complicated matter; but the result is a filament, composed of an alloy, in a dense shiny, coherent state and homogeneous throughout, with great resistivity, flexibility, and strength. What more can be wanted? There is no information as yet as to life, candle power, voltages, and consumption. But all this from America appears too comprehensively good to be true.

The "Financier" has been pointing to the decline in the profits of the Metropolitan Electric Light Companies—the dividend announcements just made by the St. James and Pall Mall Company and the Westminster Electric Supply Corporation having given our contemporary an unpleasant reminder that the prosperity of these once flourishing enterprises is steadily on the wane. And these are Companies with exceedingly choice districts. The St. James Company are now only paying 10 per cent., as compared with 12½ per cent. for 1905 and 14½ per cent. for the preceding eight years; and the diminished distribution requires £1000 to be taken from the contingency account. The Westminster Corporation have slipped down 2 per cent., by 1 per cent. stages, during two years. The South London Electric Supply Corporation only recommend 3 per cent. on the ordinary shares; being a decline of 1 per cent. The reduced price of current so adversely affected the Smithfield Markets Electric Supply Company that they are carrying forward their surplus profits, instead of distributing them. The London Electric Supply Company continue a 4 per cent. dividend. The Metropolitan Company curtailed their interim dividend; and last year it may be remembered the Charing Cross, the Kensington and Knightsbridge, and the Metropolitan were compelled to reduce the shareholders' participation in profits. Incandescent gas lighting has proved more formidable than the electric supply companies imagined would be the case; and they have had to considerably reduce their prices to meet the competition. They have also, in our opinion (if we may be permitted to form and hold an opinion on things electrical), taken an excessively broad view of the question of differential prices. There is the further fact that more money has to be spent in the district to get new business; and all round the tendency is for the yield to shrink on new capital expenditure. Then there is the dearness of copper and of machinery generally, owing to the higher cost of materials. Coal, again, has been at a higher figure, and will be higher still this year. Therefore, at the moment, prospects do not seem to be in the way of improvement. In conjunction with the reference to reduced dividends, our contemporary also calls attention to the great depreciation of the market value of the Companies' shares. The present prices are as follows (the figures in parentheses being the prices ten years ago): Brompton and Kensington £5 (11 3/16), 8½; Charing Cross, &c., £5 (15), 4; Chelsea £5 (12¼), 5¼; City of London £10 (30¾), 10; County of London £10 (16⅛), 9; Kensington and Knightsbridge £5 (13⅝), 10; London £3 (4 1/16), 2¼; Metropolitan £10, (22⅛), 7½; Notting Hill £10 (20½), 13½; St. James' and Pall Mall £5 (19½), 9½; South London £5 (6⅛), 3; Westminster £5 (18¾), 10. The "Financier" describes the declines as "substantial."

ENGINEER, CONTRACTOR, AND CORPORATION.

A long and important dispute—reputed to have cost each side £20,000 in law expenses—is to be found reported in our "Legal Intelligence" columns to-day. Were it not that, in respect of part of the award of the Official Referee (Mr. Muir Mackenzie), a stay of execution has been granted with a view to an appeal, we should feel at greater liberty to comment upon some of the interesting aspects of the case of *Abram Kellett v. Stockport Corporation*. But as the appeal is applicable, apparently, to only one of the five heads of the plaintiff's claim—namely, compensation for loss of profits, for which he has been awarded the sum of £29,400—there can be no harm in drawing attention to one or two features of this important water-works action.

It took twenty-three days' hearing before the Official Referee to find out some of the facts of the case; and the essential ones are given in our report of his judgment. Here it may be convenient just to give the salient points of the story. Mr. Kellett entered into a contract under a specification and schedule of prices to do certain work for the construction of a masonry dam in the Kinder Valley, near Hayfield, Derbyshire, for the Corporation of Stockport, whose Engineer was (the late) Mr. James Mansergh. As the work proceeded, the contractor came across some faulty beds of shale in the foundations. He drew the Engineer's attention to this, and said he would not be responsible for building upon them. Delays ensued. The designs were altered, and considerable extra foundations were ordered by the Engineer—at that time, Mr. Ernest Mansergh. The alterations very largely increased the original estimated cost of the work. The Corporation took fright at the large increase of cost and sought other advice. They were advised that an earthen dam could be more safely and economically constructed than the masonry one of modified design. More delays ensued. The Corporation allowed the contractor to go on with certain work, withheld from him certain information, and eventually repudiated and stopped the contract. The contractor brings an action for breach of contract, is fully justified on all points, and is awarded £52,546 19s. 1d., and costs. Such is the brief outline of the facts; and it is hardly necessary to add, even from this bald statement, that sympathy must inevitably go out to the contractor. He did all he could—behaving in a frank, honest manner, sending the Corporation copies of his experts' reports on the faulty foundations, and ready always to carry out his part of the contract, which, nevertheless, the Corporation broke and took away from him.

One observation (which we will not now enlarge upon) suggested by this case, is the psychological reason of the moral attitude of a group of men being different from, or lower than, that of the individuals composing the group. It is the same metaphysical problem that presents itself when we find a group of humane men doing a cruel action, or cruel men doing a kind one. Another point concerns the relationship of engineer, contractor, and corporation. In cases such as this, the Official Referee says, in so many words, "The engineer is not the mere servant of the corporation." We believe that this principle could be beneficially extended to a great many other instances—especially in the gas industry. It would, in our opinion, prove of general advantage if many engineers would regard themselves less in the humble light of servants, and more in the higher plane of masters—in all technical matters, the engineering masters of their boards of directors or their committee men. A weak, subservient engineer will only ruin himself, his board, and his company.

Lastly, we think that this Stockport case may be pointed to—among several other instances, and some of which are not very remote in the history of gas affairs—as showing the dire results that may follow from treating the contractor with reserve, not to say suspicion, instead of with openness and confidence. Our view is, and indeed the real and legal view is, that when a contract is entered into between two parties, be they corporation and contractor or anyone else, thereby is established a mutual relationship for the good of both, with mutual rights and duties; and a spirit of "give and take," and of helpful and friendly partnership should be the characteristic attitude and effort of each. If such a proper feeling were more general in all contractual undertakings, it would prove of benefit to the parties themselves and to the community at large.

FLAME v. ELECTRICAL STANDARDS OF LIGHT.

The resumed discussion, at the meeting of the Institution of Electrical Engineers, on Mr. C. C. Paterson's paper on "Light Standards" and the "High-Voltage Glow-Lamp," of which a report appears on another page of to-day's "Journal," did not add much to what has already appeared with reference to flame standards. A written communication from Mr. A. Vernon Harcourt, F.R.S., was unfortunately not read by the President, who, however, stated that it called attention to one or two points of considerable importance. That being the case, it is difficult to understand why it was withheld from the meeting, and will not be allowed by the Institution to see the light of day until it appears with the report of the discussion in the "Journal" of the Institution—by which time interest in Mr. Paterson's paper will have abated. The President, however, gave some clues to the points dealt with by Mr. Harcourt, and we propose to avail ourselves of these in our comments on the subject.

Mr. Paterson's paper and the discussion thereon have primarily raised the broad issue whether electricians shall accept a recognized flame standard of light, or whether they shall adopt a new electric lamp standard. Now, we have it on the authority of Mr. Paterson, Mr. A. P. Trotter, and other electricians, that it is no use setting up an electric glow-lamp as a primary standard. If, therefore, electricians are content to accept the Harcourt or other flame standard as a primary standard, why is it necessary for them to employ electric glow-lamps as secondary standards? The answer would doubtless be that the flame standard is subject to variations in value with variations in the atmospheric conditions, of which electric lamps are independent. Accepting this contention as broadly correct, it becomes pertinent, however, to compare the probable source and degree of error in photometry due to the use of either standard. We will take the Harcourt standard as our flame standard—merely remarking that some electricians prefer the Hefner, which is somewhat less sensitive to variations in atmospheric conditions.

A flame standard may be affected by (1) vitiation of the atmosphere, *i.e.*, by increased carbonic acid and diminished oxygen content; (2) by variations in the barometric height; (3) by variations in atmospheric temperature; (4) by variations in the degree of humidity of the atmosphere; and, finally, (5) by alterations in its immediate environment—such as would affect the direction or rate of flow of air currents to and from it. Now it must be assumed that no photometry worthy the name will be conducted in any but a properly warmed and ventilated room—*i.e.*, one maintained by hot-water pipes at 60° to 70° Fahr., and with air inlets and extraction flues arranged to renew the air, without perceptible draughts, at such a rate that the carbonic acid present will at no time exceed 8 volumes per 10,000 volumes of air. Such a standard of ventilation is not difficult of attainment even in crowded rooms and theatres. Mr. Paterson admits that no candle-power difference is observable with the Harcourt standard when the variation in the proportion of carbonic acid is restricted by about such a maximum. His remark apparently applied also to the effect of the corresponding diminution in the proportion of oxygen. Thus with a reasonably well ventilated photometer room, vitiation of the air is a negligible factor with the Harcourt standard. Similarly temperature changes (although entirely disregarded by Mr. Paterson), if within a range of 10° Fahr., may be disregarded, since a photometer room should be provided with proper heating arrangements. The degree of humidity, moreover, will be subject to relatively small changes if the room is kept at a temperature of 60° to 70° Fahr., and occasional excessive dryness rectified by obvious means. It is easy, however, to observe the degree of humidity, and when necessary to correct (according to the now established formula) the value of the standard flame. The one practically uncontrollable condition is the variation of the barometric height; and for this a correction must be made according to the formula, in cases where the light under test is an electric lamp, which is presumably unaffected by the variation. The fifth source of variation can obviously be excluded without difficulty.

Given the observance of the reasonable precautions indicated, it is clear that the only variations in the value of the Harcourt standard will arise from variations in the barometric height and less often from variations in humidity, for both of which corrections are easily applied. There is no other known source of variation; and, most important point of all, the standard is unaffected by lapse of time. It is a matter of common knowledge that Harcourt lamps have been in daily use in London gas-testing stations since 1898—that is to say for over eight years—with a use underestimated at (say) 5000 hours; and it does not appear to have been alleged that they have so far departed appreciably from their original value. They started—we believe after due verification by the Metropolitan Gas Referees—as primary standards, and remain in use to the present day equally reliable as at the outset, and not differing one from the other.

In regard to electric glow-lamps as standards, it is true that they are independent of atmospheric conditions, except temperature to some extent, and possibly, to a negligible extent, barometric pressure. It would be useful if the variation which atmospheric temperature undoubtedly gives rise to were accurately determined. Their value, however, must be determined by comparison with some primary standard, such as the Harcourt lamp; and, even with every precaution in manufacture, it does not remain constant. Let us listen to what Mr. Paterson has to say about the Fleming-Ediswan low-voltage standard lamps—admittedly the best electric standards prepared. He examined ten specimens for periods varying from 400 to 600 hours. The efficiency was initially about 4·5 watts per candle, and 4·3 watts after 500 hours. A drop of over 4 per cent.! The best curve obtained is that of one lamp which remained constant for 200 hours! Mr. Paterson goes on to say:

> "The first point which is evident from an inspection of these curves [of the candle-power of the lamps over a period of 600 hours] is that the performance of filaments specially prepared for constancy cannot be predicted with certainty. If a lamp is to be used as a photometric standard of the first grade, its history for 100 to 200 hours should be known, and its life curve should be closely watched in order to ascertain the point at which it is beginning to flatten out. . . . A properly aged specially prepared low-voltage filament if burnt for, say, ten minutes a day for five days in the week should last two or three years without changing the half of one per cent. in candle power, provided that no excess voltage is applied."

That is the best that Mr. Paterson can say for electrical standards of light. If electricians find such limited use of a standard of light adequate for their requirements, and rest content in the knowledge that it is at best a secondary standard, we may refrain from any comment on the purpose served by their photometrical labours. We are satisfied, however, that many will prefer a more durable and less capricious standard, even though it be of the flame type. It is open to them, if they waive their objections—mostly unreal—to a flame standard, to obtain in the Harcourt lamp (or in the Hefner lamp, if they prefer the smaller unit) a primary standard, as durable and as trustworthy as the primary standard which would be used for the standardization of the electric secondary standards which the National Physical Laboratory apparently desire to exploit.

MOTOR VEHICLES AND TARRED ROADS.

At the Institution of Civil Engineers last Tuesday evening, a paper, on "Modern Motor-Vehicles," by Colonel R. E. B. Crompton, was read and a discussion upon it begun. The subject is a very topical and important one—appealing as it does to everyone, especially the "man in the street." Although gas engineers are thus interested in it like everybody else, there are at least two aspects of the subject which concern them in a particular degree. The first, of course, is in the matter of road-construction and the use of gas-works' tar; the second (of lesser importance) is the adopting of steam motor-waggons for their own purposes, and the use for them of gas-works' coke. Before dealing with these two items, it may be of interest to give a short general outline of Colonel Crompton's paper.

The universal interest in the matter of motor-vehicles is indicated by the columns devoted to it in the Press, and the fourteen technical journals relating to it. Of commercial vehicles alone, it is calculated that in the year 1905, the output was 3500; their value being computed at £1,250,000. The author calls to mind that the road locomotive was antecedent to the railway locomotive; and he refers to early English engineers (like Hancock and Gurney) who brought the road engine to a practical stage of working between 1820 and 1835. Colonel Crompton does not make any mention of our own William Murdoch; but we believe it is the gas historian Matthews, who affirms that the inventor of gas lighting also astonished people by running his "little steam carriage" along the road. Upon what evidence this statement is made, we are unaware; but it is certainly of interest in linking together the gas and motor industries in the inventive brain of a common pioneer. Mr. W. W. Beaumont, who opened the subsequent discussion, also called attention to the advanced stage of mechanical efficiency to which these early engineers brought their motor carriages—notwithstanding the fact that they had to work with tools far less numerous and perfect than are at our disposal to-day. Colonel Crompton makes it clear that these early road locomotives disappeared, not through mechanical defects, as is commonly supposed, but solely owing to their being driven off the roads by other and conflicting interests. Had this been otherwise, what might not have been the state of road locomotion at the present day? After steam ploughing-machines, came agricultural portable and traction engines. Then, in 1885, the modern era started with the Daimler motor and petroleum spirit. The author then considers the general arrangement of motor mechanisms, the driving power required (incidentally remarking that, though Watt's 33,000 foot-pounds per minute was the standard 1 H.P., it was only the average power, and a horse could exert for an appreciable time up to 250,000 foot-pounds per minute), the rolling and air resistances, wheel construction, tyres, gearing, steering, skidding, fuel, and costs of working. All of this is in Part I. of the paper; Part II. consisting of specifications and working costs of various types of vehicles. Altogether, it is a very complete and useful summary of a vast subject, though perhaps all the data are not to be unreservedly accepted.

Let us now look at what is said about roads, which particularly interest the gas engineer. The railway locomotive designer has only to consider his engine; for the railroad is regular. Not so the motor designer; for his roadways are various. Practically,

all the improvement so far has been made in the motors, and very little indeed has been done to the roads. Road authorities have fallen into a false sense of security owing to the many years that their roads have been subjected only to light traffic. They have used faulty materials and faulty methods; and now all this must be changed with the greater number of vehicles using the highways. Water cannot any longer be relied upon as the means of holding together the top of the road. Water as the binding medium has led to excessive camber being given to the roads—12 inches in a roadway 24 feet wide; whereas if some waterproof material were used on the surface, the camber could be reduced to 4 inches, with two straight slopes starting from the centre line of the road. There might even be only a single rise of 4 inches—all surface water draining away to one side. The result would be less wear of the wheel and of the road, less noise, less dust, and less cost of maintenance. But to keep the road in a monolithic condition, the particles must be combined by something which will not evaporate.

It was Mr. E. P. Hooley, the County Surveyor of Nottingham, who first of all suggested the impregnation of hot blast-furnace slag with distilled tar. Colonel Crompton says: "The tar, which is so abundantly produced at gas-works, is cheap, and is readily obtainable all over the country; and if, as has been done by several of the more enlightened among the surveyors, it be properly toughened by distillation and by the addition of suitable tempering materials, it acts very efficiently as a binding material under English climatic conditions of temperature and moisture." Thus a new ideal in road construction can be reached; for tar can be so tempered as not to be too soft in summer, nor too hard or brittle in winter. Tar so used should impregnate the top 4 inches of road metal, which would thus be waterproof. Side-slip or skidding would be diminished; and the cost of maintenance of both road and wheel would be reduced. Even merely painting or spraying the road-surface with tar has produced extraordinary results. The rolling resistance is lessened; and the tar-toughened road has fewer serrations—consequently producing less tremor, noise, and vibration.

In his after-remarks, Colonel Crompton said that the co-operation of road engineers was essential, if success along these lines was to be attained. He also drew attention to there now being a private fund for a large-scale experiment, to show whether something other than water ought not to be used for binding road material. We venture to think that this important matter is one that might commend itself to the Institution of Gas Engineers; for surely the hearty co-operation of all gas engineers and managers should be secured in finding a new outlet for their tar, and in assisting towards the ideal dustless road. Is there not a National Dustless Roads Committee in existence, which might be approached, if this has not already been done?

A brief word must suffice for our second point of gas interest—namely, the use of, and fuel for, steam motor-waggons. Whether horse haulage for coal or coke services in connection with gas-works should be replaced by mechanical traction is a question to be decided upon the merits and conditions of each case. The author of the paper works out the costs of running nine different vehicles; his Table VII. being the one of most interest to us, as it relates to a 6-ton steam-waggon, using gas-coke, and drawing one trailer—the maximum load being 10 tons. It is, moreover, we are glad to note, practically the lowest in the cost of working per net ton-mile—amounting to only 1½d. The average daily mileage is taken at 50 miles; the number of working days per year at 275 days; and the average annual mileage at 13,750 miles. The other items are made up as follows:—

	Per Annum.	Per Mile.
Wages (driver at 40s., lad at 15s. per week)	£143 0 0	2·50d.
Fuel (gas-coke, 65 tons at 8s. per ton)	26 0 0	0·45
Lubricants (48 lbs. grease at 10d.; lubricating oil, 60 gallons at 1s.)	5 0 0	0·09
Maintenance and depreciation	100 0 0	1·74
Rent of waggon-shed	25 0 0	0·44
Insurance (fire and third-party)	25 0 0	0·44
Water	3 10 0	0·06
Licence and sundries	5 10 0	0·09
Contingencies	7 0 0	0·12
Total	£340 0 0	5·93d.

With an average load of 8 tons one way, or 4 tons both ways, the cost per ton-mile of load, as we have already said, comes out at 1·5d. No doubt, the price of gas-coke is taken at a low figure; but the various items of cost may prove useful as a guide to any who contemplate changing their haulage system.

Professor J. Wertheimer, the Principal of the Merchant Venturers' Technical College, Bristol, who, as our readers may remember, recently carried out an exhaustive series of experiments on divining for water, has received the Order of Officier d'Académie from the French Republic.

The Council of the Society of Arts attended at Marlborough House on Friday, when the Prince of Wales, the President of the Society, presented the Albert Medal to Sir Joseph Wilson Swan, F.R.S., "for the important part he took in the invention of the incandescent electric lamp, and for his invention of the carbon process of photographic printing."

PERSONAL.

Mr. J. Mackenzie has resigned his position as Gas Manager to the Marple Urban District Council. He asked that the resignation might take effect by the end of the present financial year, March 31.

Mr. A. Webb has been appointed Works Manager of the Calne Gas and Coke Company, Limited, and will take up his duties next Monday. Mr. Webb at present occupies the position of Foreman at the Chippenham Gas-Works.

Mr. J. W. M. Richardson, Assoc.M.Inst.C.E., has just been appointed Water Engineer to the Birkenhead Corporation, at a salary of £400 per annum. Mr. Richardson has been acting in this position since 1901; and even before that date he did the bulk of the work falling to the lot of the Water Engineer. In moving the appointment, Alderman Bloor said the Water Committee's previous inaction in the matter had been in consequence of not knowing exactly their position, in view of the negotiations with Liverpool and the scheme in hand to procure a supply of water from Wales. Mr. Richardson was fully qualified to discharge all the duties that would be required of him. No one was more conversant with the details of the works, both as regarded the machinery above the ground and the strata below.

OBITUARY.

The death occurred on the 2nd inst., of Dmitri Ivanovitch Mendelécff, the eminent Russian Chemist, who was universally famous as the enunciator of the periodic law of the chemical elements. He was Faraday lecturer to the London Chemical Society in 1889, when he delivered a memorable discourse on this subject; and in 1905 he received in person the crowning honour at the disposal of the Royal Society, in the shape of the Copley Medal. Deceased was born at Tobolsk in 1834, and received his education at the gymnasium, of which his father was the Director.

In the "Journal" for the 22nd ult., the death was announced of M. Aimé Wautelet, who was described as the Manager of the Roubaix Gas-Works. We learn that it was one of the sons of this gentleman, bearing the same Christian name as his father, of whose decease news reached us. We regret exceedingly the error into which we were led by this coincidence; and with the apologies we offer to M. Wautelet for its occurrence, we unite our sincere sympathy with him in the loss he has sustained.

Competition for the Best Tar for Road Making.

The Roads Improvement Association have issued the rules for a competition for the best preparation of tar suitable for road purposes. The competition is supplementary to the one for the best tar-spreading machine, the rules for which, as previously mentioned in the "Journal," have already been published. The chief object of the competition is to ascertain the cheapest method, consistent with efficiency and effectiveness, of treating crude tar—not necessarily the refined or distilled article—to make it suitable for use upon roads. The considerations which will weigh with the Judges in awarding the prizes are set out fully in the rules under the following headings: Cost, ease of application, efficiency, dust-preventing capacity, insolubility, weatherproofness, power of adhesion, time required and effectiveness of setting, and freedom from harmful or offensive constituents or qualities. The preparation which is adjudged the best will be awarded the Ballymena 100 guineas trophy, placed at the disposal of the Association by the Ballymena Woollen Factory, Limited, and also the gold medal of the Association. The Judges appointed by the Council of the Association are the same as those selected for the tar-spreading machine competition; and they include Mr. H. P. Maybury, M.Inst.C.E., the County Surveyor of Kent, and Mr. W. J. Atkinson Butterfield, M.A., F.I.C., F.C.S. The cost of the competition will be borne by the Automobile Club and the Motor Union. Further particulars, together with a copy of the rules, can be obtained on application to the Hon. Secretary of the Association, Mr. Rees Jeffreys, No. 1, Albemarle Street, Piccadilly, W., who will be glad to receive the names of tar distillers and others willing to enter for the competition. The last day for entering is the 31st of March.

The many friends of Professor Smithells who are readers of the "Journal," will, we are sure, unite with us in expressing sympathy with him in the severe bereavement he has sustained by the death of his wife, which took place last Thursday.

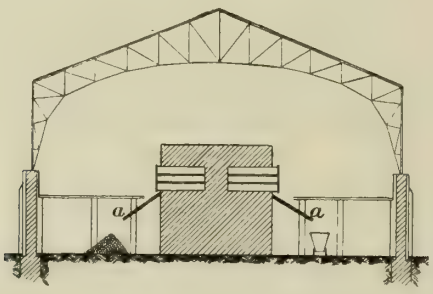
Sir Alexander Binnie, M.Inst.C.E., has consented to become one of the Vice-Presidents of the Association of Engineers-in-Charge. The President (Mr. W. T. Hatch, M.Inst.C.E.) has been elected a patron of the forthcoming Engineering Exhibition at Olympia, and the Association will be further represented by the election on the Advisory Committee of Mr. A. E. Penn, the Chairman of the Educational Committee, and of the Hon. Secretary (Mr. Capsey).

EXPERIMENTS WITH COKE-HANDLING PLANT.

By E. Körting, of Berlin.

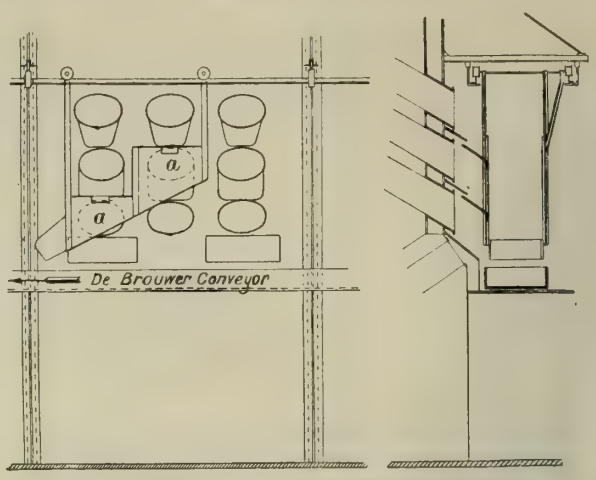
A Study of the numerous gas-works to be found in a large city is often instructive, inasmuch as they show the manner in which the gas industry has developed up to the present time. For instance, retort-settings and coke-handling plant at (let me call it) Gas-Works H have remained practically in the same condition as they were sixty years ago; while Gas-Works S has a typical example of the gas-fired settings originally introduced about 1880, and two other works, G and M, contain Coze settings and De Brouwer conveyors—thus representing more modern developments. Thus, if the two plants M_1 and M_2 are compared with G, a good idea may be obtained of the manner in which experience has led to the introduction of machinery. The different methods of working may be advantageously compared from three distinct points of view—according to their effect upon: (1) The character of the coke; (2) the consumption of energy and labour; (3) the cost of maintenance.

It cannot be denied that the original method of working, where the coke was drawn out of direct-fired retorts on to low trucks, and the latter were emptied outside the retort-house by a gentle tipping action, was highly successful in preventing any breakage. A much greater demand on the strength of the coke is made by the high gas-fired furnace shown in the illustration marked S; for, as a rule, the coke, drawn out of such retorts in small quantities, falls first on the sloping plane marked *a*, and then drops either on the floor or into a narrow-gauge truck—*i.e.*, is twice exposed to a somewhat severe shock.



Cross Section of Gas-Works S Retort-House.

Finally, in the case of mechanical working, it is necessary to distinguish between what happens in the conveyor and in the coke-store. The coke is liable to suffer (1) by falling into the conveyor, (2) by being agitated while in the conveyor, (3) by falling out of the conveyor, or from one conveyor to another, and (4) by being disturbed in the storage vessel. The first source of injury is greatly reduced by the use of the sliding conveyor (see Illustration Gr) put on the market by the Berlin-Anhaltische Maschinenbau Actien Gesellschaft, whereby the height from which the coke falls and the concussion to which it is exposed are greatly diminished. Agitation while in the conveyor seems to have little or no bad effect upon the coke. Transference from one conveyor to another does a good deal more harm; for in that case a comparatively thin stream of coke is constantly falling on to a hard surface. The amount of injury done can be diminished, though not entirely avoided, by keeping the conveyor always as full as possible, as is easy to effect in the case of Coze



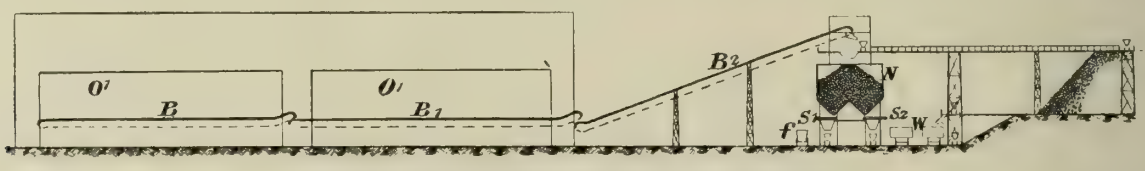
Arrangement G_2—The Adjustable Coke Shoot.

retorts, vertical retorts, and horizontal retorts discharged with a ram. Even the filling of large storage vessels with coke is an operation of some difficulty. A thin stream of coke ought not to be allowed to drop by itself out of the conveyor, but in all cases a small receptacle full should be allowed to accumulate and then be emptied all at once. A fall of considerable height is never advantageous.

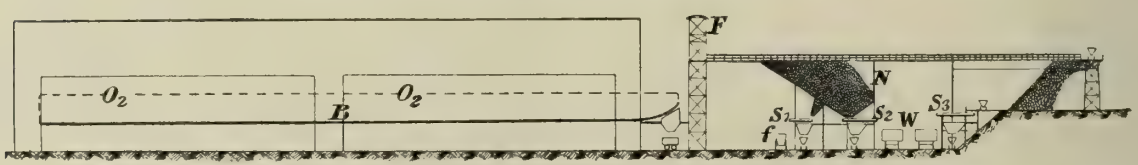
The illustration marked M_1 shows diagrammatically the first method adopted by Gas-Works M for handling the coke mechanically. It will be observed that there are three separate conveyors—that is to say, that the coke is disturbed two or three times; while the storage vessel N is of great depth. The plant should be compared with that shown in the illustration M_2, which indicates the newest form of apparatus. Here only one conveyor is employed, which, in spite of its great length, has worked up to the present time without giving any trouble; while, moreover, its length can be reduced to one-half in a few hours' time if the furthest bench of retorts is thrown out of action. Under the sloping part of the conveyor (see Illustration M_{2a}) a small intermediate hopper is arranged, and above it the floor of the conveyor is broken away. Thus a sliding plane is provided down which the coke falls quite gently. From the hopper, trucks are filled, raised on the lift, and emptied into the main coke-store. The latter is also provided with a sloping wall on the side nearest to the elevator, so that here again a gentle declivity is provided for the coke to slide down. Underneath the storage vessel sieves S are provided, so that the coke falls into the truck W or the conveyor F in a perfectly clean state; while the smalls are sorted once more.

In Gas-Works G, it was found impossible, for local reasons, to construct the conveyor in a single length. Moreover, owing to the very high pressure on the conveyor at certain times, the coke could not be screened underneath the main storage vessel. It was therefore necessary to erect above it a long sorting apparatus, with accessory conveyors for grading all the coke made. The sloping side wall of the store was therefore arranged under the extreme end of the conveyor, so that coke had again an inclined plane to roll down, whatever the direction given it by the opening of appropriate dampers.

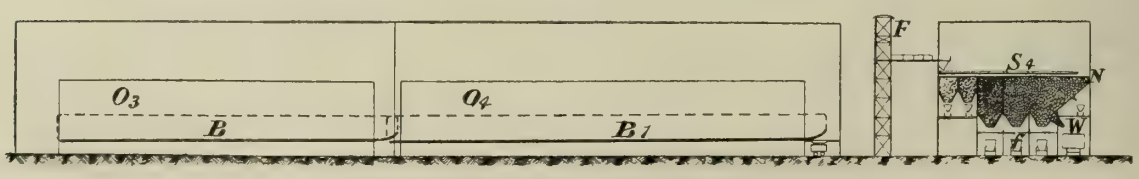
In order to ascertain the effect produced on the coke by the different arrangements for handling it which have already been



Arrangement M_1—Old Mechanical Plant in Gas-Works M.

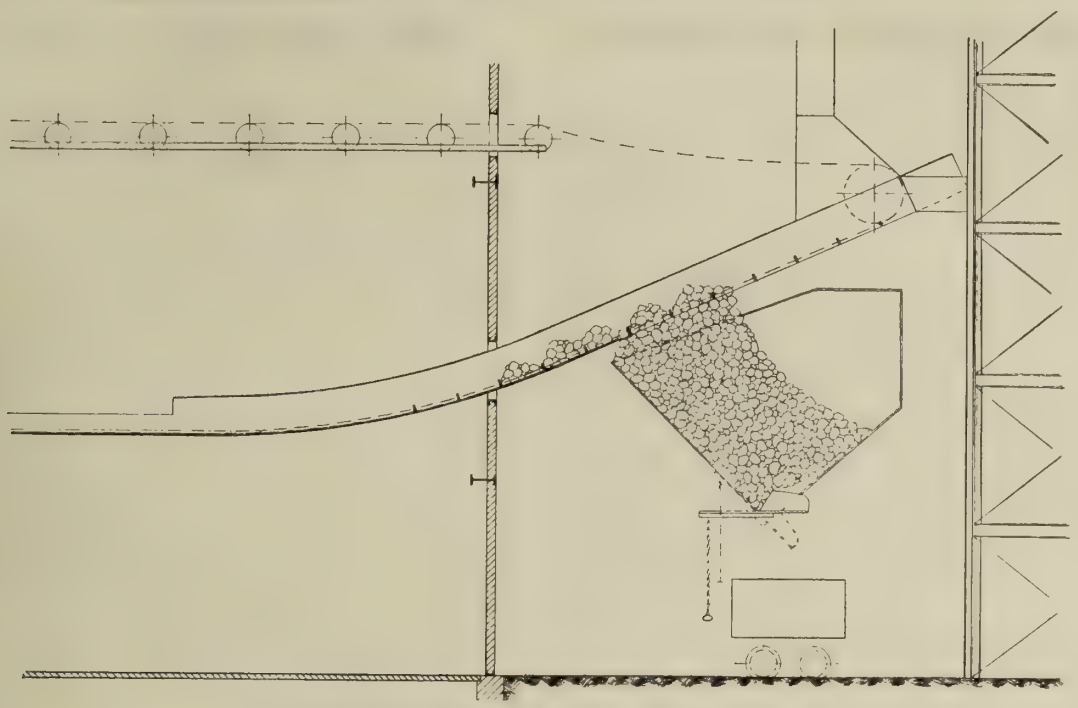


Arrangement M_2—New Mechanical Plant in Gas-Works M.



Modern Mechanical Plant in Gas-Works G.

O_1 Eight Benches of Coze Retorts. O_2 Nine Benches of Coze Retorts. O_3 Ten Benches of Coze Retorts. O_4 Thirteen Benches of Coze Retorts. B B_1 B_2 De Brouwer Conveyors. N Night Hopper. F Lift for Coke Trolley. S_1 Rocking Sieve for Carts. S_2 Rocking Sieve for Waggons. S_3 Rocking Sieve for Storage Coke. S_4 Rocking Sieve for Sorting Coke.



Arrangement M_{2a}—Enlarged View of the Sloping Conveyor.

described, experiments were carried out for considerable periods of time—*i.e.*, for at least six months—at the different works; the quantities of coke of various sizes being accurately determined. A distinction was drawn between the amount of dust produced by the action of the breaker and that by the handling plant. Calculated per 100 kilos. of coke leaving the retort-house, the figures obtained are shown in the accompanying table :—

		H. Direct Fired Retorts Worked by Hand.	S. Gas Fired Retorts Worked by Hand.	G. Coze Retorts and Conveyors.	M. Coze Retorts and Conveyors.
Large and small coke		92·9	86·9	90	90·1
Dust less than 15 mm. in size	made by removal	2·7	9·0		
	made by breaker	4·4	4·1		
		7·1	13·1	10	9·9
		100	100	100	100

It should be stated that the coal carbonized on Gas-Works H was almost entirely English, and that only a small store of coke could be kept there; whereas in the other factories large quantities of Silesian coal were also consumed, the coke from which passed through the plant.

It will be seen that there is hardly any difference in the proportion of coke accidently broken on works where gas-fired retorts are worked by hand and Coze retorts are fitted with De Brouwer conveyors—more particularly so when it is remembered that the mechanically sorted large coke from Gas-Works G and M is much cleaner than the forked-coke obtained in Gas-Works S. On the other hand, direct-fired retorts give a coke remarkably free from dust, especially when English coal is carbonized. This advantage, however, is not so great as it might be, because, even when the market conditions for the sale of large coke are as favourable as is the case in Berlin, there is nevertheless always a demand for smalls. When the latter cannot be separated by screening, as is the case in Gas-Works G and M., a coke-breaker must be used, which naturally produces a good deal of extra dust. It may, therefore, be said with perfect propriety that machine labour on a gas-works does not exert an unfavourable influence upon the coke.

A comparison between the three different varieties of handling plant is also instructive. On its way from the retort to the waggon or the conveyor, the proportion of large coke, small coke, and dust recovered from 100 kilos. of original coke obtained on carbonizing roughly equal parts of English and Silesian coal is shown below.

	M_1.	M_2.	G.
Large coke	68·5	78·0	72·3
Small coke	22·0	14·1	18·2
Dust less than 15 mm. in size	9·5	7·9	9·5
	100	100	100

It will be evident from the figures relating to Plant M_2 that the mechanical conveyance of coke gives most excellent results.

In the following table are recorded the average outlay on wages and power per 1000 kilos. of coke transferred from the retort-house or store into the railway trucks, barges, boiler-house, &c., or from the retort-house to the store in the five gas-works referred to.

Gas-Works		H.	S.	G_1.	G_2.	M.
Wages	M.	2·33	1·98	2·36	1·08	0·69
Power	,,	0·01	0.06	0·06	0·08	0·09
	M.	2·34	2·04	2·42	1·16	0·78

The economical superiority of the mechanical handling plant is at once manifest. It has now to be seen whether the economy in wages may not be neutralized by high maintenance charges. The mechanical plant on Gas-Works M was brought into operation in the autumn of 1901, since which time costs per 1000 kilos. of coke moved and made ready for sale have been as follows.

	1902.	1903.	1904.	1905.	1906.
Conveyor	—	—	0·18	0·21	0·17
Screening	—	—	0·14	0·11	0·17
Total M.	0·23	0·19	0·32	0·32	0·34

The last item in the year 1906 of 0·17 mark includes the expense of painting the overhead store. The cost of maintaining the coke-handling plant in Gas-Works G during its first year of employment was a good deal lower still—being only about 5 pfennige per 1000 kilos. Unfortunately, the cost of maintaining the coke-breaker and screening plant and the numerous sums expended on wheelbarrows, forks, &c., in the days of hand labour were not entered separately on the books. An approximate calculation of these items on Gas-Works G before the introduction of handling plant shows that they should have amounted to some 16 pfennige per 1000 kilos. Hence the cost of keeping the machinery in good condition does not in any case appreciably increase the expenses involved.

The correctness of this opinion is borne out by the fact that during the last four years the total cost of keeping the buildings, machinery, retort-settings, railway lines, &c., in good condition, together with all the repairs requisite, has been sensibly identical in all the four gas-works under consideration, whether they were constructed on old or new lines. The repairs effected on Gas-Works M, moreover, cannot be considered as brought to the lowest point possible. The chief source of interruption and of expense on Gas-Works M was the rising conveyor, a piece of apparatus which is not found in the new plant M_2. In the latter case, a single conveyor replaces a treble one. Again, the costs of maintaining a conveyor are also diminished by improvements in its construction—by making its various parts stronger and its carrying surfaces of interchangeable cast-iron plates.

The side walls of the overhead coke-store are no longer built of thin plates of iron, but of thick planks of wood—experience having shown that the latter last much longer. There are therefore good grounds for asserting that the costs involved in using mechanical handling plants may be brought down to almost the same figure as when hand labour is employed. The excellent results obtained during the first year when the new plant on Gas-Works G was in use—viz., 5 pfennige per 1000 kilos—bear out this assertion.

From the figures that have been given above, it is quite evident that, when conditions are such as generally obtain in Berlin (or more correctly speaking such as obtain at the works discussed), the adoption of coke-handling plant introduces notable industrial advantages which justify the extra amount of capital necessary for their construction being sunk in them.

Mr. Councillor Edwards, who has just been elected an Alderman by the members of the Leicester Town Council, is well known to readers of the "JOURNAL" as the Chairman of the Gas and Electric Lighting Committee. By his great devotion to the interests of these important departments of the Corporation, Mr. Edwards has certainly deserved the honour which has thus been bestowed upon him.

"MONARCH" (PLAISSETTY) SOFT MANTLES.

Our readers have been made aware, from descriptive articles published in the "Journal," that, in connection with the Plaissetty system of mantle manufacture, entirely new ground has been broken—from the genesis of the mantle to the present stage. Plaissetty's invention itself introduced novelty; and since then there have been several improvements which have been departures from the ordinary lines of mantle making. The race at the present time among those interested in mantle production is—not so much with the object of getting the mantle itself to contribute more than it can already do in the development of illuminating power under proper treatment, but with the object of imparting to the mantle greater durability and resistant power. And it is with this primarily in view that those whose concern it has been to evolve a greater perfection from the Plaissetty mantle have taken a unique step. They have by dint of great perseverance, investigated the problems that required solution in order to give direct to the gas consumer a mantle that could be handled as safely as any other soft textile material, and that would not need any special burner or high-pressure gas for burning off, but be simply treated in the usual way on an ordinary burner. What has been done in this matter was fully described in the "Journal" for March 6 last (p. 637) and April 17 (p. 169). There is no occasion, therefore, to define the actual developments further. At that time, criticism was made of certain details associated with the new soft mantles—not only in our columns but by others who put the mantles to trial. The interval has been spent in minimizing the incidental disadvantages then found; and now it is considered by those who have been busying themselves in this direction, that they can come before the public with a more perfect mantle, in both inverted and vertical form. To this end, the Combined Incandescent Mantles Syndicate, Limited, has been formed; and from it it is proposed to form a Company, with a capital of £250,000, to acquire "the benefit of all contracts, patents, plant, machinery, and a freehold works in an immediate London suburb, where the Plaissetty mantles are at present being manufactured." Mantles, incorporating the principal changes that have been effected in the original system of manufacturing the Plaissetty mantle, are also made in the customary collodionized form; and the Welsbach Company are selling these on royalty.

But regarding the soft mantle, the advantage, of course, starts with their pliability. They can be crushed up in any manner without detriment to their structure; and as now supplied, they are packed in flat circular-shaped boxes or envelopes which occupy little room, and are not so awkward for packing as the old long cylindrical shaped boxes. However the mantle is dealt with, there cannot be, without being purposely torn, any fracture in them when placing them on the burner, nor are they subject to destruction in the process of installing them in position. On being burnt off, the mantle adjusts itself perfectly to the flame of the particular burner upon which it is being used, whether the gas is being supplied at the lowest or at the highest point in the range of common or local pressures. It is most remarkable what variations in the shapes of flames are found with various burners—both upright and vertical—and even with different burners of the same type; and therefore the form of the mantle must have some effect on the amount of incandescent surface obtained. If the mantle does not fit the flame perfectly, there must be portions of it that are not incandescent; and a spotted mantle—that is to say, a mantle not fully incandescent—is a most undesirable thing. When, too, the mantle has adapted itself to the flame, the homogeneous character of the constituent filaments, it is claimed, prevents any further shrinkage. We have referred to one disadvantage of these mantles before, and we do not see that it is to be overcome, in using the flame of an ordinary burner for destroying the combustible part of the mantle—that is, the fact that time is involved before the consumer develops the maximum illuminating power. The illuminating power derived from the mantles is an ascending quantity for some hours; but when it has reached its maximum, it is maintained, with ordinary attention to the burner, for considerable periods. In addition to the question of preservation from injury prior to use, and the adaptability of the mantle to any shaped flame, whether at high or low pressure, or whether the burner is of an expensive or of a moderate or low-priced type, additional strength is claimed for the soft mantle.

At the present time, an exhibition of the mantles on various burners is being made at No. 3, Wellington Mansions, Buckingham Gate, S.W.; and there anyone can have an opportunity of judging the effect upon different types of burners. Of course, the mantles used on good burners give an excellent light; used on indifferent burners, there is a great depreciation of the light value. However good a mantle, one cannot do it justice if the conditions of use are not good; but what the Syndicate claim is that, given a bad burner, a mantle that can adjust itself to the flame will do better than a non-adjustable one. In claiming this, however, they are not advocating bad burners; but they know the propensity of certain gas consumers for cheapness. The mantle has slight disadvantages; but the advantages, it is expected—by those who are promoting the commercial exploitation of the mantle—will, in the eyes of users, completely annul those disadvantages. The soft mantle is to be known as the "Monarch;" and it is being made in all sizes for all types of burners.

JUNIOR INSTITUTION OF ENGINEERS.

The members of the Junior Institution of Engineers had their annual dinner at the Hotel Cecil on Saturday night; and, in accordance with precedent, they and their guests derived a considerable amount of pleasure from the event. The President (Mr. William B. Bryan, M.Inst.C.E.), the Chief Engineer of the Metropolitan Water Board, was in the chair; and professional eminence was strong both on his right and left hand sides. The Legislature was represented by the Right Hon. Lord Farrer, and Mr. E. B. Barnard, M.A., M.P., the Chairman of the Works and Stores Committee of the Metropolitan Water Board. Among the numerous company were also Sir Alexander Kennedy, the President of the Institution of Civil Engineers, Sir R. Melvill Beachcroft, the Chairman of the Metropolitan Water Board, Mr. Charles Hunt, the President of the Institution of Gas Engineers, Mr. Dugald Clerk, the President of the Society of British Gas Industries, Dr. Glazebrook, the President of the Institution of Electrical Engineers, Mr. Samuel Cutler, sen., Mr. Samuel Cutler, jun., Mr. Lewis H. Rugg, the Chairman of the Junior Institution of Engineers, and Mr. W. T. Dunn, the Secretary. Succeeding the loyal toasts, the President proposed "The Houses of Parliament." He spoke of his thirty years' experience as a witness before Parliamentary Committees; and he asserted that the Committees of both Houses brought a large amount of ability to bear upon their work. Referring to the busy life led by Mr. Barnard, who was to respond for the House of Commons, he mentioned that he was Chairman of the Works and Stores Committee of the Metropolitan Water Board, who had cast upon them the duty of supplying about 7 millions of people with an adequate quantity of pure and good water. At the meeting when he (Mr. Bryan) entered upon his duties as President of the Junior Institution, a railway engineer who was present told him the average weight of merchandize carried in a truck. A mental calculation showed him (the President) that one day's output of the Metropolitan Water Board would fill between 700 and 800 miles of railway trucks. Lord Farrer, in the course of his reply, showed that, from personal observation, he held the opinion that too severe specialization in engineering is not good, and that the training of an engineer should be based on wide and broad views. One point from Mr. Barnard's speech was that he should like to see at the head of the Local Government Board a man of the highest talent, so that when professional engineers went before him, they would be before a man of their own calibre. That was not the position at present. The toast of "The President and the Junior Institution of Engineers" was in the hands of Mr. B. A. Raworth. There were many interesting points in the President's acknowledgment; one being that the consumers of London only paid 1s. 1¾d. per ton for water. He also stated that, when the Institution invited him to be President, he felt a great deal of diffidence about undertaking the office, as he feared it would absorb more time than he could spare from his work. But he had not felt the position at all irksome, owing to the great courtesy and help he had received from Mr. Dunn. He also spoke of the very prosperous condition of the Institution. Mr. Rugg proposed "Our Guests," and, in the course of his remarks, mentioned that Sir Alexander Kennedy was the first President of the Institution in 1888. Sir Melvill Beachcroft, fresh from electioneering work in connection with the London County Council, was troubled over the question of the rates. He stated that the Metropolitan Water Board paid no less a sum than £400,000 a year in rates, or 13½ per cent. on their gross income, and something like double that on their net. He sometimes thought the Water Board ought to do what the Gaslight and Coke Company did—state on their demand notes how much of the amount was represented by general rates. The Board left themselves very largely in the hands of their Engineer; and it would be hard to find the equal of Mr. Bryan for the great work for which he was responsible. Sir Alexander Kennedy, referring to Lord Farrer's remarks, considered that there was no greater mistake than severe specialization in engineering; and he urged junior engineers to take an interest in every branch of the profession, as well as the one to which they were to specially devote themselves. They could not make themselves engineers in every branch; but they were better engineers in their own branch by knowing something of what was done in others.

If proof were needed of the value of a judicious combination of good typography with photographic illustration in the production of a trade catalogue, it would be found in the one for the current year which is being sent out by Drakes Limited, of Halifax and Leeds. It is of convenient size (9½ in. by 7 in.), and the illustrations which fill its 170 pages are taken from photographs of plants the firm have manufactured and erected at various gas-works and collieries. The attention of gas managers may be specially directed to the patent tube regenerator furnaces and the labour-saving machinery shown in the catalogue. The photographic reproductions are very effective; while the outline diagrams of mouthpieces, furnace frames and doors, &c., are remarkably clear. The catalogue is printed on art paper, which admirably sets off the illustrations, is strongly bound, and is furnished with an index, preceding which are a number of views of the works.

MR. PATERSON ON LIGHT STANDARDS.

The discussion on Mr. C. C. Paterson's paper, on "Investigations of Light Standards and the Present Condition of the High Voltage Glow Lamp," was resumed at the meeting of the Institution of Electrical Engineers last Thursday night. The portions of the paper in which we are mainly concerned were published in the "JOURNAL" for Jan. 29, p. 279, and comments on the contribution appeared in the same issue p. 266, and last week, p. 333. As on the previous occasion, the greater part of the discussion on Thursday turned upon questions affecting electric glow lamps; and light standards were only incidentally touched upon by various speakers.

The PRESIDENT (Dr. R. T. Glazebrook) announced that they had received a written communication from Mr. A. G. Vernon-Harcourt, which would be published in the "Journal" of the Institution. Mr. Harcourt called attention to one or two points of considerable importance. He referred to the fact that the effect of atmospheric conditions on the candle power of flame standards was not really recent knowledge; it was present in the minds of those who worked at the subject long ago. Mr. Harcourt also alluded to the influence of temperature generally on the flame standard and on electric light standards.

Professor AYRTON resumed the discussion; his remarks being chiefly directed to matters affecting the life and testing of electric lamps. He said Mr. Paterson had given the members a very interesting paper from many points of view, including a great number of apparently carefully conducted experiments. If one dared to criticize tests which had emanated from so revered a laboratory as that at Bushey, one might be inclined to hesitatingly suggest that a little more time might have been given by the author to the consideration of what his predecessors had done on the same subject, and that the reflection which he had been able to bestow upon the results did not equal the exertion and energy he had devoted to carrying out the tests. The speaker then went on to show that to the consumer of electricity, the prolonged life of glow lamps might not be of such importance as the cost and consumption of electrical energy. Proceeding, he said that at the last meeting, Dr. Fleming expressed some astonishment that the comparison of the amyl-acetate lamp and the pentane standard appeared to differ to-day from what it was a few years ago. That was a subject to which a good deal of attention was devoted in the discussion of Dr. Fleming's paper three years ago. He (Professor Ayrton) found he had some tests that he himself made, in a comparison between the amyl-acetate standard and the pentane standard, twelve years ago—in 1895. In this case, however, it was a 1-candle pentane standard; and then the ratio was 0·98 of 1 candle, as given for the 1 candle pentane lamp. He did not know at the time what he pointed out in the discussion of Dr. Fleming's paper—that 1-candle pentane standards differed so much one from another. He obtained in 1903 such standards, and compared them. They were all supposed to give 1-candle; and he got as much as 12·5 per cent. difference between them. One would like to know, in regard to the comparison of the flame standards given by Mr. Paterson, whether the flame standards at the National Physical Laboratory, the Reichsanstalt, the Laboratoire Centrale, and the Laboratoire d'Essais had ever been compared with each other. Either the President or Mr. Paterson would perhaps tell them whether or not the standard at Bushey had been sent from one place to another, or whether the standards had been made in the various countries, according to certain dimensions that had been laid down. In the case of the 1-candle standard, very accurate dimensions were given in Professor Harcourt's patent specification; but he (Professor Ayrton) found that not one of the three 1-candle standards to which he had referred had the dimensions that were detailed in the patent specification; and therefore they could not agree one with the other. Another point to consider was as to whether the quality of the pentane used in the various lamps was defined. The specific gravity, too, doubtless made an important difference. The Board of Trade Photometric Committee of 1895 came to this conclusion: "We therefore recommend that the pentane air flame furnished by a Dibdin argand burner, having the form and dimensions set forth in the appendix, and used in the manner there defined, be accepted as giving the light of 10 standard candles, and that this flame be authorized and prescribed for official use in testing the illuminating power of the gas supplied by the London Gas Companies."* He thought that it would be interesting to compare the Dibdin standard, of which he had one, with the actual official standard; and the result was that, taking the Harcourt as 10, the Dibdin was 10·4. This was a difference of 4 per cent. between what the Board of Trade Committee recommended and what was now stated as being the official standard—viz., the one in the custody of the National Physical Laboratory. When such differences occurred, one could see that tests made by the various kinds of lamps—for instance, the Hefner amyl-acetate lamp and the Harcourt pentane lamp—would give different results. It must be remembered, however, that the Dibdin 10-candle standard, unlike the pentane 10-candle standard had a glass chimney which must introduce inaccuracy. The electricity consumer's position in relation to the change to higher voltages and loss of light from glow lamps was then dealt with by Professor Ayrton.

The PRESIDENT stated that the pentane lamp was the standard of the Metropolitan Gas Referees. The lamp used at the National Physical Laboratory had been repeatedly compared with that standard. At the Reichsanstalt, there were two lamps. One of the two was compared with the standard of the Gas Referees; and the other lamp agreed with it very closely. One of the French standards was also compared with that in possession of the Gas Referees.

Mr. A. P. TROTTER remarked that the author had referred to the Hefner unit as the "official" standard of light in Germany. He (Mr. Trotter) thought it was something more than that. He had not traced it to its legal source; but he believed it to be the legal standard in Germany. The pentane standard which had taken the place of the older parliamentary candle standard was, he understood, not a legal standard. It was an official standard; and it was legal only in the sense that it had been largely adopted officially for testing London gas, so that it was rather limited in its application. The Hefner standard was very nearly adopted at the International Congress at Chicago. In the communication which he proposed to send to the "Journal" of the Institution, he had given reasons why he believed it was not adopted. His own work in photometry had been of a relative character, and not concerned with absolute measurements. But he must say he had used the Hefner lamp, and appreciated it as a thoroughly practical standard. It did not much appeal to electrical people, because it was a flame standard. Flame standards were excellent things for gas, because the corrections cancelled out. He was not, however, sure the gas people knew that there were any. [Laughter.] However, it was no use setting up a glow lamp as a primary standard. There had been an immense amount of work on platinum standards, but it had been given up as hopeless; so that they were forced for the present to use flame standards. As a flame standard, he thought the position that the Hefner lamp had taken in the scientific world entitled it to more respect than had been given to it. It was admitted by the author that all the corrections were better in the case of the Hefner than in the case of the pentane; but the pentane was a larger unit (10 candles), and there was the colour difficulty. But he attached little importance to the colour difficulty. In the laboratory, they must face the colour difficulty as they did other things. The Hefner lamp was a cheap thing, one could almost put it in one's pocket, and it was an easy thing to manipulate. It certainly had great advantages.

Mr. COOPER said their gas friends generally had their eye on the proceedings of the Institution; and in one of the gas papers there had been articles criticizing Mr. Paterson's paper, under such headings as "Electrified Photometry" [*ante*, pp. 266, 333]. Attention was called in these articles to the results obtained in the tests with regard to the effect of carbon dioxide on the pentane standard. Were not the results vitiated somewhat by the variation in oxygen? The speaker called attention to the experiments of Dr. Liebenthal in this connection (*ante*, p. 280); and added that he did not think Mr. Paterson could neglect the point as to oxygen. The results given in Table I. did not appear to be consistent. They got a large variation at first, and little later on. He should also like to know how a fair sample of the atmosphere was taken. There appeared to be two ways in which the atmosphere might affect the pentane standard—one by the air that was mixed with the pentane; and the other by the air round the flame. He did not know whether Mr. Paterson differentiated between the two. The method of ventilation that Mr. Paterson had in his photometer-room also seemed to be very unpleasant; and something more comfortable might, it seemed to him, be arranged.

Mr. LE MESURIER, in the course of some observations on the glow-lamp tests, said their gas friends were making a good many remarks about lamp standards. In one breath they said that pentane standards were perfectly easy to manage, and in another breath criticized the suggestion that the standard lamp was to be kept at Bushey. It was a great thing for the whole electrical industry that there should be one standard, and not dozens all over England.

The PRESIDENT mentioned that he could only allow Mr. Paterson five minutes for his reply; and his answer to the main parts of the discussion would be communicated to the "Journal" of the Institution.

Mr. PATERSON only dealt with one or two points affecting electric lamps, and ignored entirely the question of flame standards. It is to be hoped that he will give an opportunity for the portions of his reply bearing upon flame standards receiving circulation in our columns.

* See "JOURNAL," Vol. LXV., pp. 1010, 1021.

Engineering and Machinery Exhibition.—In the "JOURNAL" for the 15th ult., it was announced that another Engineering and Machinery Exhibition is to be held at Olympia from Sept. 19 to Oct. 19 next. The Hon. Advisory Council, of which Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers and of the Junior Institution of Engineers, is a member, held a meeting at the Holborn Restaurant on Monday last week, and unanimously elected Mr. Edgar Worthington, B.Sc., as Chairman—a position he filled in connection with the Council of the exhibition last year. Among other matters considered was the prospectus, which was approved with some minor alterations.

PRESERVATIVE PAINT FOR IRON AND CEMENT.

Dr. Roth's "Inertol."

In the "JOURNAL" for the 15th of May last year, attention was called to the above-named material, which, according to a report made by Herr Kölle, a member of the Frankfort-on-Main Town Council, and the Chief Director of the Water Department, had been successfully employed, in competition with numerous other preparations, for painting the cement lining of an elevated reservoir, and certain portions of the iron mains in the city, to protect them from the action of the water, which, owing to the quantity of free acids in it, had been found to have a very destructive effect. The matter has lately been again brought under notice by Herr Kölle, in an article in the official Government organ of the German building trade, in the course of which he furnishes the following particulars.

The reservoir in question was erected a few years ago at a cost of a million marks. It was constructed in four divisions or chambers, and had a capacity of rather more than 6½ million gallons. The walls had been faced with a view to the application of some protective composition up to the point reached by the water. This work was commenced in the spring of 1902 by painting the walls twice on two divisions of the reservoir up to a height of 13 feet, and the bottom and adjacent parts three times. In order to meet the possibility of the water acquiring a disagreeable taste from the paint, the surfaces were rubbed down with a solution of permanganate of potash; and before being filled with water they were thoroughly rinsed. These measures proved quite adequate. The other two divisions of the reservoir were not touched until the efficiency and durability of the particular composition selected had been proved. After the second chamber had been in use for 200 days, the paint began to show the effects of the water upon it; and it was decided to discontinue the use of the composition employed, and to try experimentally one recommended by Dr. Carl Roth, a chemist residing in the city, who had been engaged to examine the paints used and their effect upon the water. In the spring of 1903, his composition was applied in the fourth division of the reservoir, in conjunction with others; and after a trial extending over 196 days, its superiority was proved, and it was decided to coat the third division with it. This was done in the spring of 1904. In the autumn of that year and in 1905 the divisions of the reservoir were emptied, and inspection of the condition of the various surfaces treated presented some interesting and instructive facts in regard to the utility of the different materials used. These may be epitomized as follows.

During December, 1904, an inspection was made of the first chamber (coated with two of the materials selected), which had been in use for 813 days. Both compositions were found to be completely charred, and they could easily be picked off the wall. But they protected the underlying cement coatings from the attacks of the water. In the second chamber (coated with the same materials), after being in use for 868 days, the paint presented a worse appearance than in the other—parts having already fallen off, and the concrete showing signs of being attacked. The third chamber was coated throughout with Dr. Roth's composition, and after being 206 days in use, on the side walls as well as on the bottom, the cement and the iron parts were found to have kept in perfect condition, and to have retained their full lustre. The fourth chamber, partly coated with Dr. Roth's composition, to which was added some sulphur and alumina, and partly with various other compositions, after being in use for 638 days, showed the surfaces painted with the first-named composition to be the only ones in good condition. On parts of the walls left bare and unprotected by any composition, not only was the cement completely destroyed, but, where the water could penetrate, the concrete behind was eaten away and reduced to powder.

If these experiments had left any doubt as to the value of Dr. Roth's composition, they would have been dispelled by an inspection made in November, 1905, at which the following results were obtained: The first chamber, after 1155 days' use, showed that the paint had been very nearly destroyed and the cement attacked. In the case of the second chamber, which had been in use for 1210 days, the paint had been nearly destroyed, and the cement was seriously attacked; while the concrete showed signs of cracking and partial destruction. In the third chamber, coated with "Inertol," the surface of the walls and the iron parts presented an excellent appearance after being in use for 522 days. The fourth chamber, after 942 days' use, showed equally good results. Upwards of 300 days had elapsed since the previous inspection, and no appreciable change was visible in the surfaces coated with Dr. Roth's composition; while in the other cases both the cement and the concrete had been seriously attacked. The result of the trials was a decision to paint the whole of the reservoir with "Inertol," and also to use it freely for coating the new pipes to be laid in the city, which were found to require some protection.

Herr Kölle concluded by saying that though "Inertol," which has been put upon the market by Herr Paul Lechler, of Stuttgart, does not offer absolutely imperishable protection from the effects of water highly charged with acids, it has proved in his case to be better than any other preservative coating. He had found that it kept in better condition if applied to cement rubbed off with felt discs than to concrete surfaced with a trowel. It could only be applied successfully on perfectly dry surfaces which had been previously warmed.

SUCTION-GAS PLANTS AND GAS-ENGINES.

At a recent meeting of the Leeds Section of the Institution of Electrical Engineers, Mr. HUGH CAMPBELL read a paper on the above subject.

After briefly referring to the development of large gas-engines worked by blast-furnace gas on the Continent, the author summarized some of the reasons for his strong belief in the future of suction-gas plant—viz., its very high economy, extreme simplicity, its cleanliness, and the small amount of space it occupies. He gave a comparative table of costs for steam and gas working, from figures which had been supplied to him by the Engineer and Manager of the Guernsey Electricity Station, Mr. Arthur G. Bird. Both stations were of exactly the same size and capacity, and under the same management; so that they afforded a fair comparative test as to the economy of each system of working. It showed the total works costs in the case of steam to be 0·937d., and in that of gas 0·498d. per unit of electricity generated. He also submitted some figures showing the working cost for an 80 B.H.P. gas-engine set at Broxbourne. In this case, the gas plant was standing idle for 16½ hours out of the 24, and the engine was working only at about half-load. But, even under these conditions, the fuel consumed did not cost more than 0·08d. per H.P. hour. Another example given was the cost of working for one month three gas-engines, each driving 50 kilowatt sets from one gas plant at works at Peterborough, which amounted to 2·9d. for 20 B.H.P. hours. The author said the saving in fuel effected by the substitution of suction gas for town gas varied from 50 per cent. with gas at 1s. 4d. per 1000 cubic feet, 60 per cent. with gas at 1s. 9d., 66 per cent. with gas at 2s., 70 per cent. with gas at 2s. 6d., to 75 per cent. with gas at 3s.

The author next dealt with the design and construction of suction-gas plants, and described his firm's standard plants of 100 and 20 B.H.P. He then considered the various objections raised to the use of these plants. It had been alleged, he said, that, owing to the impurity of the gas, the wear and tear of the engines was great, and the cost of cleaning heavy; that the quantity of lubricating oil used in a suction-gas engine was excessive; that the gas generated was poisonous, and liable to cause harm from its not possessing a pungent smell like ordinary illuminating gas; and that the effluent from the coke scrubber was noxious and caused a nuisance. To all these objections Mr. Campbell replied in detail. He acknowledged that, like all producer gases, suction gas is poisonous and non-odorous; but he said that as the whole plant was working slightly below atmospheric pressure, there was no possibility of an escape of gas. The only time there was an escape from any part of the plant was when it was being started; and then the gas was blown to waste through a properly arranged chimney or waste-pipe.

The final section of the paper dealt with gas-engines. The author pointed out that there are two kinds of engines principally made—viz., the two-cycle, or Clerk; and the four-cycle, or Otto. He said the two-cycle engine could be better named as a two-stroke engine—that was to say, for every two strokes of the engine an ignition took place. The well-known engines of the Körting Company and Herr von Oechelhaeuser were constructed on this principle. Having described engines of the types named, Mr. Campbell said one of the best at present on the market was that constructed by the Nuremberg Company on the Otto cycle. The method of governing gas-engines was next considered, as affecting regulation of speed and economy in working; and the author described successively the quality and quantity governing the mixture and the hit-and-miss system. Lantern slides were shown illustrating the various methods of construction adopted in the different systems, as well as one of the vertical four-cylinder gas-engines which the author's firm have introduced mainly for electric lighting and power stations. Each cylinder works on the Otto cycle, and has its own independent set of inlet and exhaust valves and ignition gear.

In conclusion, Mr. Campbell said that for continuous working with a suction plant it was always necessary that the gas-generator should be in duplicate—*i.e.*, two gas-generators with one set of coke scrubbers. The plant was worked with one generator at a time, and for so long as it could be run without requiring to be clinkered. Before it was shut down for clinkering, the duplicate generator was set going; and for a few minutes both generators were opened to the engine. After this the used generator was closed down for clinkering, and made ready for the next run.

Burst gas-mains recently cut off the supply of natural gas at Cleveland, Ohio. The mains, carrying gas from West Virginia to Cleveland, burst in a swamp about 35 miles south of Cleveland, the explosion destroying about 300 feet of pipe line. The two damaged lines carried 60 million cubic feet of gas per day.

The first American gas-engine patent (No. 3597, May 25, 1844) was granted to Stuart Perry, of Newport, New York, for his two-cycle double-acting air-cooled gas-engine. Perry proposed to enclose the cylinder and its immediate appendages in a case, through which cold air could be blown by means of a rotary fan or other blowing apparatus. Mr. Hugh Dolnar, in an article in the "American Machinist," claims that Perry not only was the original inventor of both air and water cooling of gas-engine cylinders, but also was the first to devise a hot-tube ignition system, which was patented many years later by Daimler.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

A Meeting of the Western District Section of the Association was held in the Technical College, Glasgow, on Saturday evening, and was well attended.

Mr. T. Orr (Motherwell) said that Mr. M'Leod, the President, was ill and unable to be with them; and, in the absence also of Mr. W. Wilson, the Vice-President, he had been asked to take the chair.

LAYING-OUT GAS-WORKS.

Mr. R. A. Campbell (Provan) read a paper on "Laying-Out Gas-Works." In it he dealt with the points of the selection of a site; the surveying of it, the taking of levels, and making sections and cross-sections; the boring of the ground, in order to enable the position of the various buildings to be determined; the making of roadways, railway sidings, and drains; the construction of the gasholder tank; and the building of the retort-house, coal-store, and other structures.

At the Provan Gas-Works, he said, it was necessary to make a roadway. This roadway was 60 feet in width, extending from Cumbernauld Road to the works, a distance of fully half-a-mile. About 1000 feet of it was in cutting; the remainder being embankment. The greatest depth of cutting was 16 ft. 5 in., and that of the embankment 21 feet. It was found that the excavation would considerably exceed the material required for the embankment, so to get over the difficulty a brick-works was erected; and the excess material, which was of boulder clay, was converted into bricks. Hence the Provan works were built of bricks manufactured from clay excavated on the site.

Speaking of the construction of the gasholder tank, he said that after the cope was laid, it was necessary to make marks on the cope, representing the face of the standards; the trainer by this time having been removed. In one case of a tank having a diameter of 283 ft. 7 in., a piano wire, about 150 feet long, was obtained, at one end of which an eye was securely fixed. Through this eye a set-pin was passed. The set-pin was screwed into a plate about 4 inches square, which in turn was made secure in the most convenient manner. The wire was then strained by means of a union screw until a spring-balance fixed at the other end of the wire indicated a pull of 60 lbs. By means of a steel tape, a distance of 142 ft. $2\frac{7}{8}$ in. was measured off, from the centre of the set-pin along the wire. At this point, a small piece of tin was soldered to the wire, the required point marked distinctly on same, and the measurement checked. The wire, &c., were then taken to the site of the tank, where a small platform was erected, at a convenient height, over the centre-point. The centre-point was next accurately fixed on the platform; and the 4-inch square plate was fastened securely exactly over the centre-point, by being screwed to the platform. The set-pin was then passed through the eye at the end of the wire, and screwed into the plate. The end at which the balance was fixed was next taken over to the cope of the tank, and made secure to a steel bar driven into the ground at the back of the cope. Then, by means of the union screw, the wire was again strained up to 60 lbs., and the point on the piece of tin transferred to the cope, which point represented the face of a standard. The wire was then swung round; and this was repeated until all the necessary points had been fixed. The method proved very successful.

The gasholder tank having been set out, he would advise that the foundations of the retort-house and coal-store be pegged out; but, before proceeding, it would be wise to fix a convenient base-line. This base-line would be of value when setting out the various buildings. They must next fix a convenient point on the base-line from which all measurements must be taken. This point must then be marked on the ground with great care, and might be termed the zero point.

The author concluded with a description of how the position of the buildings was to be fixed from the base-line.

Mr. P. M'Dougall (Helensburgh) read a paper on

CARBONIZATION OF COAL FOR THE MANUFACTURE OF GAS.

The author explained that it was not his intention to discuss the advantages claimed for the different types of retort-settings, nor their construction, but simply to point out the operation taking place in the retort-house when coal was carbonized for the manufacture of gas. The method of carbonizing was then described; after which the author treated of the functions of the hydraulic main and the trouble with stopped ascension-pipes. Dealing with the work of the exhauster, he went on to say: One of the most important factors to successful and economical carbonization is the proper regulation of the exhauster, and to maintain as steady a vacuum as possible in the hydraulic main. It is obvious these conditions can be obtained provided the different mains are of ample area for the gas made. It is also necessary to have a complete and efficient arrangement of gas-actuated steam-governors, working upon a frictionless equilibrium valve, fixed on the steam supply-pipe. Sometimes it happens that the gas-main becomes too small for the make of gas, which means that an excessive vacuum has to be maintained at the exhauster inlet, so that the required amount may be obtained on the hydraulic main. In my opinion, the best method of governing the exhauster is to have the vacuum pipe carried direct from the governors to the foul main. By this arrangement, you have the exhauster governed direct from the retort-house. In works where the output of gas is too small to keep a man regulating the vacuum on the exhauster, I think a vacuum indicator would prove itself a good investment, as it would ensure better working in the retort-house.

I might here remark that an instrument of this description is in use at the Helensburgh Gas-Works. The instrument is constructed on the same principle as King's pressure-gauge, having a large dial gauge, with a big movable hand connected to an electric bell. On the dial is fixed a platinum wire to the vacuum required. Should the pull at any time exceed this, the hand strikes the platinum wire, thereby making contact, and causing the bell to ring in the retort-house, thus drawing the attention of the man who is in charge of the exhauster. I might add that the indicator also serves as a pressure-gauge. The gauge in use at Helensburgh was fitted up about eight months ago, and has given satisfaction.

In making tests of coal before ordering, I think gas managers are inclined to attach too much importance to sperm value, owing to the fact that sperm value is at this time of day only a secondary consideration. In my opinion, a better criterion would be (where there do not exist statutory obligations as to illuminating power) the net cost of coal per 1000 cubic feet of gas produced, *minus* residuals saleable. This seems to me to afford a much better and more reliable basis for comparison.

As you are aware, the carbonization of coal for the manufacture of coal gas is practically speaking a chemical process; energy in the form of heat being the agent for bringing about the chemical changes. In order to work retort-settings economically, it is most desirable that a knowledge of what takes place inside the producer should be understood; and to acquire this requires a careful study of thermo-chemistry. Energy, like matter, can neither be created nor destroyed; but when chemical action takes place, it reappears as energy in another form. When a chemical change occurs, the total amount of matter taking part in the change reappears in different form in the products of the change. Chemical compounds can be of two kinds—exothermic and endothermic—the reaction by which they are produced being an exothermic and an endothermic change. In the formation of exothermic compounds, heat is liberated—*e.g.*, $C + O_2 = CO_2$—and when endothermic compounds are formed the heats of formation are expressed by a negative sign, as a certain amount of heat is absorbed in bringing about the change—*e.g.*, $C + S_2 = CS_2$. It is also important to note that the difference in energy under the same conditions of a system, must ultimately be the same, irrespective of the method by which the system is conveyed from one state to another. When carbon and oxygen are burnt together, the carbon unites with the oxygen evolving 14,500 B.Th.U. on complete combustion, irrespective of whether the reaction goes on in one or two phases.

Thus by one phase $C + O_2 = CO_2 + 14{,}500$ B.Th.U.
Or by two phases $C + O = CO + 4{,}000$ B.Th.U.
$CO + O = CO_2 + 10{,}500$.

The heat formed in the producers is the result of chemical reaction between coke, as the substance, uniting with the oxygen. In order to work regenerative settings economically, it is essential that the reactions between carbon and oxygen taking place in separate parts of the setting should be distinct. There are two forms in which the interaction between carbon and oxygen can take place.

(1) $C + O_2 = CO_2 + 14{,}500$ B.Th.U.
(2) $2C + O_2 = 2CO + 8{,}000$ „ = 2 lbs. coke.
(3) $2CO + O_2 = 2CO_2 + 21{,}000$ „ = 2 lbs. coke.

It is necessary in working regenerative settings that reactions (2) and (3) should take place. Now, let us examine briefly the conditions requisite for this. The air passes up the bottom of the producer, and is there acted upon by the carbon of the coke, yielding CO_2 as shown in the first reaction. This again interacts with the carbon, and is reduced to CO as it passes through the mass of hot coke.

In calculating the quantity of heat evolved, we will take as the unit 1 lb. of carbon on complete combustion with oxygen, and base our calculations on this quantity. Now, 1 lb. of carbon and 2·6 lbs. of oxygen yield on complete combustion 14,500 B.Th.U. and 3·6 lbs. of CO_2; or if air be used, 1 lb. of carbon to CO_2 requires 11·85 lbs., yielding 12·85 lbs. of CO_2 and nitrogen. As this 3·6 lbs. of CO_2 passes up through the strata of hot coke, it is decomposed to 2·3 lbs. of CO. Of course, the reaction must be complete. Before this reaction can take place, energy to the extent of 10,500 B.Th.U. is absorbed. If we deduct 10,500 B.Th.U. (heat absorbed in the formation of the above compound) from the total 14,500 B.Th.U., it leaves 4000 B.Th.U. as being the net heat evolved.

I think it is clear that before the reaction $2\,CO_2 = 2CO + O_2$ can take place, energy in the form of heat is required. In gas-works producers, the method usually employed in practice is to feed the generator with hot coke drawn from the retort set immediately above it. The advantage to be gained by the use of hot coke in the producer is that the temperature is not reduced, as would be the case if "cold" coke were employed. Besides, there is also a certain quantity of sensible heat saved. The carbon of the coke, on combining with the air which has previously been

preheated, or which may not have been preheated, is converted into CO and CO_2 in quantity depending on the temperature of the strata of fuel in the producer. The primary object is to obtain high heats with a minimum amount of fuel. It is possible to consume large quantities of coke without getting the temperature desired; while less quantities of coke, if consumed properly, would give the required temperature.

Suppose the quantity of products of combustion to be doubled, it follows you can only have half the temperature (absolute scale). This brings out a most important point in the working of retort-settings—*i.e.*, if more secondary air is admitted than is required for the complete combustion of the producer gas, the superfluous air acts as a diluent on the products of combustion. It must not be forgotten that the chimney-draught has a direct bearing on the amount of secondary air drawn in. When the producer gas begins to get less, the amount of primary air is also reduced; the results being that the heats are lowered. However, this I believe may be obviated by adopting one of the self-acting regulators for secondary air now on the market. The best and most accurate method of determining whether the products of combustion contain excess of secondary air, is to have a test made with a simple form of apparatus. The chimney-draught also requires careful attention, because, when you increase this, you also increase the liability of external air finding its way into the setting through any cracks there may be.

When chemical reactions take place, the heating effect is either positive or negative. The heat that is produced or absorbed in a chemical change which results in the formation of a particular compound, is termed the heat of formation of that compound. Thus, $C + O_2 = CO_2$. In bringing about this reaction, 14,500 B.Th.U. are evolved; or in the reaction $C + O = CO$, 4000 B.Th.U. are evolved. As I have previously referred to these heats as heats of combustion, it must not be forgotten that, while they are heats of combustion, they have also another definition—they are heats of formation of the above compounds. It is important for us to note that the heats of formation are always the same, irrespective of the conditions under which they are obtained. So we see the quantity of heat produced by the combustion of any substance is the same, no matter whether the combustion takes place rapidly or slowly, provided the same final products are formed. On the other hand, we have seen that the reduction of CO_2 to CO and O can only be brought about at a loss of heat equivalent to 10,500 B Th.U., and the decomposition of CO to C and O takes place with a loss of 4000 B.Th.U. In the realization of the reaction $CO_2 = CO + O = C + O_2$ heat amounting to 14,500 B.Th.U. is required, which amounts to the same as the heat required for formation. In other words, the heat required for the formation and decomposition of carbon dioxide is the same, but the result is the reverse—*i.e.*, on formation, heat is produced; on decomposition, heat is absorbed.

Discussion.

Mr. W. Ewing (Greenock), in opening the discussion, said it was very interesting to know that Mr. Campbell had read a paper from practical experience, which was the basis of all good work. In laying out a gas-works, it was of vast importance, as Mr. Campbell had pointed out, to deal with the important details first; and he had shown that, from the road into the works to the ingress and egress of material, before and after carbonizing, there were many important details to be taken into consideration. He had pointed out that the first essential was a section and cross sections, and a block plan of the works. These, undoubtedly, were the basis of the future gas-works; and the gasholder tank was the first essential, because it took the longest time to construct. The retort-house received next consideration; and then everything else would follow in correct order. Mr. Campbell undoubtedly was an expert in the laying out of gas-works, and he had given the Association a paper of great interest—in fact, one of the most important papers they had had. He had given them some information relative to the troubles in gas-works, such as the choking of ascension-pipes. This trouble was not common in Scotland, but some people had it with them; and as one of these, he could sympathize with others who had recently gone through the mill. In his case, choked ascension-pipes were due to through retorts and erratic seals or high heats. He anticipated this; but as soon as he obtained absolute control of the erratic conditions which existed, the choked ascension-pipes disappeared, but not entirely until the retorts were blocked in the centre. There was always a difficulty, with two ascension-pipes, in getting the gas to pass equally up them both. A cold blast of air on one side would send the larger portion of the gas up the other pipe, with the result that the gas was decomposed, and carbon was deposited. He had had the carbon in all forms. He had a bottle of carbon at home which resembled pills—about the same size and circularly formed. With regard to the other paper, Mr. M'Dougall dealt with the application of a governor to the hydraulic main. This was a very important recent development, inaugurated by that eminent engineer, Mr. Carpenter. He (Mr. Ewing) so favoured it that he had had one fitted to a new section of his works not yet quite completed; and, going a step farther, he had made arrangements for a displacer in the hydraulic main, so that it would be possible, by turning a wheel, to work with or without a seal. Working without a seal, the figures given to him by one of the best authorities, who had done this for many years, showed that an increase of about 500 cubic feet of gas per ton of coal could be obtained. This, of course, was a very important factor in gas production; and, not only so, but there was a decrease in the deposit of carbon inside the retort, which induced a larger yield. The reduction of pressure also added very considerably to the production of gas. In connection with the selection of coal, Mr. M'Dougall had given them some very valuable hints. There were so many different sorts of coal in Scotland, that it was difficult to select the kind necessary for gas manufacture. They found that sometimes the coal they desired was 9d. or 1s. or even 1s. 3d. per ton dearer than another kind; and they were forced, against their will, by way of economizing, to forego the pleasure of using the better coal. Unfortunately, gas committees (who had no knowledge of the production of gas) always liked to buy cheap coal. They were apt to think coal at 10s. per ton was as good as that at 12s.; but they sometimes got 4s. per ton more value out of coal at the latter than at the former price. It was desirable to make very careful tests of coal. He always made these in experimental apparatus. But, beyond this, there should, in all large works, be plant with which they could carbonize on the basis of their general working. They would then have reliable data, under working conditions, which would be available, not for one year, but for all the years in which the coal might last. Reverting to Mr. Campbell's paper, he had omitted to compliment the skill of the late Gas Engineer to the Glasgow Corporation—Mr. Foulis—in laying out the gas-works at Provan. He supposed the cheapness of their construction, and the efficiency of working obtained under the management of Mr. Webster, had shown to everyone that the works were the production of a master mind. There was nothing in the way of elaboration about them. Everything was plain, simple, and efficient; and through the skill of Mr. Webster, under Mr. Alex. Wilson, the new Engineer, everything had been carried out in the most efficient way. But it was sometimes necessary to have ornamental works. If they looked at those which had been completed in Edinburgh, they had there the realized conception of a master—a man of great experience, and with a bold policy. The feeling one had in going into these works was that they had been laid out on scientific lines, and in a style which was worthy of the city of Edinburgh, which anyone with an eye to the architectural or the ornamental would at once see.

Mr. W. Blair (Helensburgh) said the only drawback he saw to the subject of Mr. Campbell's paper was that they did not often have the opportunity of laying out works, or of shifting them, as he remembered had been done several times in Glasgow. With reference to Mr. M'Dougall's paper, he did not know that he could say much more than that the study of gas manufacture certainly required to be very carefully gone about. Gaseous firing itself required this. Unless they grasped both the technical and the chemical part of what they were dealing with, they would be working in the dark. By studying the subject on the lines Mr. M'Dougall had laid down, and testing the waste gases, they would see if they were getting the quantity of heat that was really contained in their settings. With regenerative settings, they were able, with almost ordinary coal, to carbonize 100 lbs. of coal with from 10 to 12 lbs. of coke; or, to take the quantity of coke produced, about 25 per cent. of the whole was all that was required for carbonizing. This was quite a general view of any ordinary regenerative setting.

Mr. D. Vass (Airdrie) said he had recently had considerable alterations in his works; and the same conditions applied in the alteration of old works as in the building of new ones. Among the first things was the question of bores; and he would give the hint that if they were having bores put down, they should be on the spot the whole time. Mr. Campbell appeared to go on the idea of making practically level works. Sometimes the site was on the side of a hill, and it might be advisable, in such a case, to take advantage of the formation of the ground. In his own case he had sulphate-works recently put down, and he could receive the acid on a high-level railway; and on this high ground he had constructed an acid tank, to hold the large quantity of acid they had to take in from time to time from the railway waggons. He could take the acid down to the sulphate-works simply by gravitation. The same applied to the handling of coal. The proposition that gas-works should be at the lowest level of the site had its limits. In Airdrie it was a question whether they should remove the works to a lower site outside the town, or extend them where they were. The question that weighed most with him was that within a radius of half-a-mile they sold three-fourths of their gas. This determined him, to this extent, that the lower level, although it was 100 feet below the present one, was not so suitable as the present level, seeing that in their works they had good railway accommodation. They resolved to extend where they were, although they had to buy up a saw-mill to enable them to do so. If they were putting down new plant, they should do it in some relation to the existing plant—not place it at an angle to the existing plant. He had had experience of this, where two buildings were at an angle, and he had to build two gables where one would have done had it not been for the angle. Mr. M'Dougall had dealt very fully with the subject of carbonizing—in fact, he (Mr. Vass) thought he went a little over it; but the paper was one which would be well worth the study of every member.

Mr. J. Webster (Provan) contributed a little experience he had had with through retorts. He said they had a bench with eight settings of throughs. There were two sections, and a hydraulic main on each side, with tar-towers. It was pretty well on in the winter when they put them up; and they did not get

the second half of the bench quite completed. They started the four ovens which were finished, and had no trouble with them. For the other four they were waiting for the bridge-pipes; but they needed these retorts, so they decided to run them, using only one hydraulic main. Then they received the bridge-pipes for the other side, and put them on; but they never had good results from this section of the bench. The mains had been put up by the same men, and levelled as carefully as possible. The first section gave good results, but not the second. The gas went up the one side for a time, and then it would stick, and go up the other side, where also it would stick; and it was a job to get them clear. He, like Mr. Ewing, had had some experience of through retorts. He had had to make them into two; but when this was done the division walls must be made thoroughly tight, because if gas went from the one to the other there would be trouble with the ascension-pipes. High heats caused stopped pipes. In one retort-house he never had an obstructed pipe; but in another, with a slightly different setting and a little higher heat, they had a good deal of trouble.

Mr. Campbell thanked the speakers for the kind remarks they had made regarding his paper. He said his object was to make it as short as possible, and to give his experience in a brief and simple way. The record of bores he got was a correct one. He was on the ground during the whole time they were being put down. He thought Mr. Vass might have misunderstood him when he spoke about level works. What he said was that various levels of the works ought to be arranged. The Provan works had at least half-a-dozen different levels. Then, regarding the site, what he said was that the lowest would be the best one, provided the ground was suitable. Of course, if the ground were not suitable, the site would not be the best.

Mr. M'Dougall thought that, instead of Mr. Ewing asking him questions, he could give them information regarding stopped ascension-pipes. He was at one with Mr. Ewing in his remarks about coal. He had to thank Mr. Blair for his remarks. He was certainly one of the pioneers of gaseous firing, and was well qualified to speak on the subject. The quantity of fuel he was using for firing, per ton of coal carbonized, was worthy of being called attention to. It was most important to note that the charging-door for feeding the hot coke should be so placed that it allowed the coke to flow in uniformly. There were two points he should like to mention regarding Mr. Campbell's paper. First, the author had said nothing as to the quantity of land required for gas-works. He thought he was correct in saying that Mr. Herring, in his articles on gas-works construction, put it at three acres per million cubic feet daily production. Mr. Herring also stated that, when fixing on a site for new works, when land cost more than £200 per acre it was wise to go farther away, and spend more upon the trunk main from the works—distance from the town being no objection. Then Mr. Campbell had not said anything regarding the water supply, which was of great importance. He thought the most common practice was to have a well sunk close to where the steam power was generated, so that, if required, a pulsometer or other type of deep-well pump could be used for raising the water into an elevated tank, which would give sufficient pressure for their requirements. He thanked those who had taken part in the discussion on his paper.

Mr. Campbell, in reply to Mr. M'Dougall, pointed out that he said that the lowest site would be the best, provided the cost of the land was not out of the way. The cost of land in and around Glasgow was very much more than it was perhaps 100 miles to the north. Looked at in this light, it was almost an impossibility to give an opinion as to the cost of land. Regarding the water supply, he purposely omitted this subject from his paper, as the matter was a simple one. No gas-works could ever be regarded as complete without a water supply; and the usual method of getting water was by gravitation—the water being obtained from mains in the district.

This brought the proceedings of a very interesting meeting to a close.

A Self-Starting Gas-Engine.—According to "Engineering Record," a self-starting gas-engine has recently been devised which employs compressed air for starting, but not by the usual method of temporarily using one cylinder as an air-motor. The engine has five cylinders and an arrangement of crank-shaft and valve-mechanism by which one inlet-valve is partly or wholly open at all times. Compressed air is delivered directly to the intake in starting, from which it will enter the open cylinder. The compressed air is admitted through a closed-type carburettor, a check-valve in the intake preventing its escape at this point; and the engine begins to turn over until all five cylinders have thus received a charge of combustible mixture. At this time, the first cylinder has compressed the charge admitted to it, and is then fired in the usual way, starting the engine. In the starting, while each piston is rising on the compression stroke, the exhaust valve of its cylinder is lifted by a cam to relieve the pressure somewhat, and prevent compression to the point of pre-ignition. These cams are operated by a single lever interlocked with the compressed air supply; and they are thrown out of action when the compressed air is shut off, after the engine is started. The compressed air supply is furnished by a pump attached to the valve-shaft, which is automatically controlled to maintain a pressure of 100 lbs. in a storage-tank.

MANCHESTER JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held on Saturday, at which Mr. R. H. Garlick read the following paper, entitled

SOME OBSERVATIONS ON DISTRIBUTION.

I notice that at least two Junior Associations have had papers read on various phases of distribution, principally dealing with improved methods of lighting by means of high-pressure systems; but the question of the wherewithal, or the mains from the works throughout the district necessary to give these improved results have practically been left alone. I am pleased to learn that more interest is now manifested in the distribution department of the gas industry. Greater thought and care are brought to bear upon the requisite sizes of mains necessary to maintain as far as possible an equalization of both day and night pressures, which will fulfil the requirements of the consumers and prevent the harassing complaints which, in bygone times, were so numerous. These complaints are still in evidence; and increasing watchfulness is the order of the day, as discoveries made daily by our workmen show that, in an area of supply extending over many miles, mains are too small, want enlarging, and probably, as I have found, require cast-iron mains in lieu of ¾-inch, 1-inch, or 1¼ inch wrought-iron pipe supplying whole streets, to the detriment of consumers and loss to manufacturers.

How are we, then, to improve these conditions? The problem possesses many phases. Districts vary; some may be residential, others manufacturing, but all tend to the same nature of complaints—bad pressure, or bad illuminating power, &c. First and foremost comes the question, Are the mains of sufficient diameter to supply the district? This can be answered by a liberal use of the pressure-gauge—an instrument not very complicated, but one which gets one out of many a difficulty. The *modus operandi* should be to locate the particular portion of the district where complaints are most numerous. Observations should then be taken at maximum day and night pressures; the pressures taken (say) at the public lamps, with an occasional house here and there at the inlet of the meter to check the result obtained at the lamps. After the observations are tabulated, compare them with the pressures as shown at the outlet of the governors at the works; and if there is an appreciable difference in the two pressures, the inference is that there is either a stoppage in the mains or that the mains supplying that particular district are too small. The deduction arrived at is, of course, subject to the pressures taken at the lamps being practically equal. Taking, for example, the pressure at the works at 20-10ths, and at the lamps 12-10ths at the commencement and 10½-10ths at the finish of the observation, if the pressure had been (say) 19-10ths at the first lamp, 18-10ths at the next, and then dropped down to 12-10ths at the third lamp, one would conclude there was serious stoppage between the second and third lamps, and locate accordingly.

I have in mind an experience in my own district. From the works there was a 24-inch main for some half-mile, acting as a trunk main; then it was split up into two—a 16-inch and an 18-inch main—one supplying a manufacturing and residential district on a lower level than the works, the other supplying a district at a considerable elevation above the works. Owing to the excessive pull on the 16-inch main in the lower level, with a maximum pressure of 40-10ths at the outlet of the governor at the works, we had great difficulty in getting 10-10ths or 11-10ths pressure at the higher altitude. This demonstrated to us (more so as we lost 8-10ths to 12-10ths pressure from the works to the end of the 24-inch main) that larger mains were needed. These were increased accordingly—24-inch to 36-inch, 18-inch to 30-inch, and so on—and enabled us to reduce our pressure at the works considerably, while maintaining good pressures at the higher altitude. The latter experience will help our members over a difficulty of a similar kind. It may be perhaps appropriate at this point to emphasize the necessity of having your mains well laid. Attention to this factor will save an immense amount of leakage known in the reports as unaccounted-for gas.

Before laying mains, look up your tackle and have everything required. Work systematically; have all your men in the trench till sufficient ground is got out to enable you to start, and then bring back the men required to lay the main. Keep the same set of men at the apparatus, the same yarners and caulkers, &c., as by so doing they get into a regular way of working, and each man knows what he has to do. Have a good sound bed for your pipe to rest upon. Among your gang will probably be found one or two men worth a shilling or two extra per week as "bottomers up" or levellers of the trench bottom. In some cases this work is quite a speciality with them, so adept are the men. Have plenty of room at the joints, so as to insure good caulking; and be sure you have all the air driven out of the main before trying with a light for tightness. If laying an entirely new main, get a circular disc made of a layer of india-rubber fixed between two circular plates of iron or wood (the plates slightly less than the diameter of the main), and firmly bolted—the rubber projecting over the plates (say) ¾-inch. Through the centre of the plates, a long bolt is secured. Between the end of the bolt and the disc, a guide, of the nature of a circular piece of wood, also slightly less than the internal diameter of the main, is likewise secured—the width of guide being according to the size of the disc. The bolt at the guide end has an eye forged on; and through the eye a stout

rope some 12 or 14 feet long is secured. When a pipe has been laid, run with lead, and caulked, the disc is pulled along the pipe to within a foot of the socket, thereby drawing the gas with it, enabling one to test and fill in the pipe as the work proceeds. Another advantage is that one is absolutely sure there is nothing left in the main that would obstruct the flow of gas. A bladder is necessary when commencing and finishing the main. The stopper or disc may be left in from start to finish of a main, if on a straight length. In case of laying a larger main in lieu of a smaller one, it will probably be necessary to connect up every night, owing (as in my own district) to the difficulty of sending the gas round by another route in sufficient quantity to enable the usual pressure to be maintained.

Our usual procedure is to take out the old main up to such a length as will enable us to replace with the larger one within the working hours. When the last pipe for the day has been placed in position, have a short piece of pipe with a socket the same diameter as the old main, about 5 or 6 feet in length, on a spigot end of the old pipe cut off (this cutting off must be in such a position that the piece of old pipe will come in), place the 5 or 6 feet length (the spigot end in the socket of the new main, the socket end on the old main), yarn the socket end, and fill the lead space with cement; the other end, projecting into the new main, is closed up with old bricks, then a layer of clay is put on, and finally a coating of cement, 1 inch thick, on the clay. This will make a joint sufficiently strong to last throughout the night, and one that is easily broken in the morning, after the bladder has been placed in position preparatory to commencing the day's work. It is advisable to have the bladders placed at such intervals as to be easy of access. It is absolutely necessary that the air should be blown from the new-laid section, otherwise complaints of bad gas will probable ensue.

With regard to the connections that may have to be fixed *en route*, let them be of such size and section as will give the least resistance to the passage of the gas. Have them in lengths convenient to handle, and as compact as possible, having due regard to the efficient caulking of the joints. Syphon pots will have to be placed in positions according to the contour of the district—in comparative level districts, a fall of 1 foot in 400 yards. This is a matter that varies according to the locality, also the engineer's opinion. I would strongly recommend the through variety of syphon pot, in lieu of the side pot. The latter with bend under the main, and is liable to get sediment accumulating therein and preventing the condensation from entering the syphon pot, and the pumper may report the pot with (say) 4 inches in when quite possibly the main may be in a fair way of being entirely filled with water. This contingency I have known to occur.

Rules for determining the flow of gas, &c., you are doubtless fully aware of, and I have no need to recapitulate them here. But I would like to draw your attention to a set of diagrams by Mr. Cripps, which, if carefully studied, will give one at a glance everything one needs, and practically in accord with Dr. Pole's formulæ. Excellent experience can be acquired by working out your own estimates, allowing about 10 per cent. for contingencies which may arise. It gives opportunities of coming in contact with the price of pipes, lead, cost of excavation, filling in and reinstating, carting, and other details which are interesting and useful in after-years. Mains should be covered at least 2 ft. 6 in. if placed on the roadway and 2 feet if on the footpath.

After a brief survey of the mains, we come to the services. As great care should be exercised in laying services as in mains. Likewise, in apportioning the sizes thereof, a good plan is to estimate the consumption according to the number of burners or works to be supplied. Having ascertained this, find the meter required. As is well known, every meter has a certain size of inlet and outlet—5-light ¾ inch, 50-light 1½ inch, 150-light 3 inches, and so on. Putting in the same size of service-pipe as the inlet of the meter will about secure an efficient supply. It will be advisable, however, with a view of further extensions, as in the case of works, to put in a size larger. By so doing it will obviate the necessity of relaying the service at some future time.

Strengths of wrought-iron pipe vary according to districts. We use a steam strength, as our strata are very variable; a good portion being made-ground, with a liberal supply of clinkers and ashes. This kind of soil has a very detrimental and oxydizing effect on wrought iron; and unless the pipes are protected, although of steam strength, they soon have to be relaid. Some engineers encase their services in troughs. In our case, where the strata are, as mentioned previously, of clinkers, we encase the pipes in clay or sand. The use of troughs in some portion of our district, subject to colliery subsidence, would hamper us in locating escapes, which are very numerous. We frequently find wrought-iron pipe of all sizes pulled apart, or buckled up by the pressure exerted through the ground slipping. Use bends as far as possible, avoid elbows, let your services fall from the meter to the main, and insist on everything being well screwed up. Great difficulty ensues in having pipes from various makers. Although standard threads are supposed to be universal, a difference is found in some pipes from different makers.

Having also dealt briefly with services, we come to a more interesting point of how to interest the people and popularize the use of gas. How often have we proceeded to this place or that to investigate some complaint of want of pressure, or possibly bad illuminating power. When you arrive, you are told that "the gas is much better to-night," "last night it was wretched, we could not see," &c., &c. You get permission to investigate and take a few pressures, and find that at the inlet and the outlet of the meter there is ample supply, but at the fittings the pressures come down by one-half. You explain the matter to the tenant—there is either a stoppage, or the internal fittings are too small. The consumer replies that the fittings have been in use for some twenty years, and ought to be good enough for a similar period. He forgets the possibility of the accumulation of sediment in the pipes, also the fact that at the time the house was built, there were no rules and regulations as to size of pipe to be placed therein; and, furthermore, he does not understand that the 4 or 6 light chandelier is fed by a piece of ⅛-inch tubing. You have the greatest difficulty in convincing him of the true cause of the bad light, &c. How, then are we to overcome all these prejudices on the part of the consumer? Firstly, in my opinion, we ought to insist (in new property, or property that is being altered) on the internal pipes and fittings being of such a size and bore as will ensure an ample flow of gas throughout the premises needing a supply of gas.

We have in our Gas Department inspectors whose duty it is to inspect all the piping, lead or wrought iron, before being plastered or covered over, and ascertain if it is in accordance with our regulation of sizes of pipes to be used according to the number of lights the house or workshop is about to have. Until these regulations are complied with, no meter is fixed. We also authorize gas-fitters. That is, on their application, they are, after due inquiry as to their capabilities, &c., placed on our list of authorized gas-fitters, to whom we issue a copy of our regulations. This system has the effect of guaranteeing sufficient supply to the burners of the consumers. Secondly, my conviction is that we should offer every facility to the consumers which would be helpful to them in getting the best value both for heating and cooking. Exhibitions by private traders have no doubt done much; but my opinion goes in the direction of lectures in various parts of the district, having an ample supply of the latest burners, &c. Demonstrate, by experiment, the actual results to be obtained, and if you are not at once successful, it leads the consumers, or intending consumers, to a train of thought; and I have such faith that eventually, in the majority of cases, you will ultimately succeed in sending up your consumption to a pitch you never thought possible.

There are many other items that could be considered in connection with distribution—prepayment meters, the benefits they confer upon householders who prefer to pay for gas as they use it, in preference to the quarterly system, obviating thereby the payment of a deposit which is required by some corporations and gas companies. The difficulties we have are with the owners of the houses in which we instal the system. We in Salford find so much lead pipe, and a bracket or pendant with its attachments thereto for india-rubber tube, of which we supply lengths of 6 feet, likewise a griller, fixed at our expense by our own fitters.

The question as to which are best, wet or dry meters? The question of differential rates for lighting, heating, and power? Should we fix cookers free of any rental to any consumer who applies? What we think of the use of suction gas? What would be our attitude should town's gas be required as a stand-by? These and other items can be left to future occasions, or utilized by some members as the basis of a paper or papers. I have also left such questions as unaccounted-for gas, the best method of indoor lighting, subsidences due to collieries, supply of gas to gas-engines, and street lighting, to the future.

In the course of the discussion which followed, Mr. Wellens (Hebden Bridge) said he had listened to the paper with deep interest; and it brought back old memories when he was a member of the Council, along with Mr. Garlick. Mr. Wellens put before the members a plan illustrating the difficulties of an engineer in the laying of mains. Mr. Alsop (Stockport) remarked that he had listened to the paper with a great deal of interest. There were several points which Mr. Garlick had left open, and some which he had not touched upon at all; but this had been done with a purpose. It was for members in their spare time to go through the paper, and find out what these points were. He agreed with the reader in having the work done systematically. Mr. Garlick had gone into the subject in a very capable manner; and there were many favourable tips to be found by anyone who had had no experience in this line. Mr. Braddock asked if the reader had any experience with the patent lead wool. From what he could see, he thought it would be quite applicable for repair jobs; and he wished to know if Mr. Garlick could tell him whether it would be of use for a long length. Mr. Oldfield inquired if it was through being a corporation that they could insist upon the regulations with regard to fixing the meters being carried out.

Several other members having spoken, Mr. Garlick replied on the discussion. He said he had tried lead wool, and found that so much pressure had to be used that the probability was the joint would split. In fact, he could not get it to stand at all. Replying to Mr. Oldfield, the regulations mentioned were embodied in an Act of Parliament; and no meter was fixed until these regulations were complied with.

One member stated that in one of the Manchester works they had just put down a new purifying house; and the whole of the 50 joints had been made with lead wool. There were only two slight flaws. It was not necessary to hammer hard to get a good joint.

Mr. Wellens proposed a vote of thanks, which was seconded by Mr. Alsop; and the meeting then dispersed.

EXPLOSION PHENOMENA OF MIXTURES OF GAS AND AIR.

An issue of the "Mitteilungen über Forschungsarbeiten auf dem Gebiete des Ingenieurwesens" [Reports on Investigations in the Domain of Engineering], published by the Association of German Engineers a short time ago, contains a lengthy article by Dr. F. Häusser, of Kaiserslautern, on the above-named subject. Without reproducing the very voluminous tables accompanying the author's communication, it seems difficult to give a proper summary of his experiments; but in the following abstract translation an attempt has been made to indicate the manner in which his investigations were carried out, and the conclusions at which he has arrived.

The primary objects of the research were to review the accuracy of the formulæ given by Mallard and Le Chatelier for the specific heats of gases at high temperatures and at constant volumes, and to ascertain how these heats are affected by pressure. The experiments were performed on mixtures of air and coal gas, in spite of the variable nature of the latter, at different initial pressures; coal gas being selected as the combustible body because of the great practical importance of the phenomena attending its explosion, and because data are already available respecting the rapidity of its combustion in explosion engines, which data should form interesting matter for comparison with the explosion velocities observed during the investigation.

The explosion vessel employed by Dr. Häusser was a cast-iron cylinder having a capacity of 335 cubic centimetres. A cylindrical shape was preferred to that of a sphere, because in the former a piston-like stirrer could be more effectually used to secure homogeneity in the gaseous mixtures. The handle of the stirrer projected from the end of the cylinder through a stuffing-box; and it was found that the gland could be kept tight against the high final pressures if only the packing were renewed with sufficient frequency. The aperture for the igniting wire was in the side wall of the vessel, about two-thirds of its length from one end; the connection to the indicator being in the same transverse axis. The cock ordinarily used on the indicator could not be maintained air-tight, and it was therefore replaced by a ball or hemispherical valve. The connections for the gas and air inlets, the removal of the final products, &c., were closed with needle-valves, and gave no trouble. The indicator was a Rosenkranz instrument provided with a set of six springs, suitable for pressures up to 25 kilos. per square centimetre [1 kilo. per square centimetre is equal to about 0·968 atmosphere]. The paper drum was revolved by a single-phase electric motor supplied with current from the local generating station; it therefore synchronized with the dynamos within very narrow limits, revolving the paper at 1400 turns per minute. The pressure-gauge attached to the cylinder was calibrated by the Reichsanstalt.

Tests were made of the amount of heat lost during the explosion by absorption into the walls of the cylinder. For this purpose, the short igniting-coil was removed, and a long platinum wire, of known resistance, was introduced into the cylinder through the coil aperture, bent twice upon itself so as to reach almost to the two ends of the vessel, and brought out again through the indicator connection. The wall of the cylinder was drilled almost through at one spot; a thermometer being placed in the hole with its bulb in a bath of mercury, and a second inserted into the interior at the opposite end. An electric current of known wattage was then passed through the wire to render it incandescent; and as soon as the second thermometer remained constant its reading and that of the first thermometer were noted. The coefficient of heat-conductivity of the walls of the cylinder (ϵ)—*i.e.*, the amount of heat in small calories passing to the metal per second per 1° C. of difference in temperature between the interior of the vessel and the walls—was obtained by the following equation:—

$$\epsilon\,(t_2 - t_1) = 0{\cdot}239\ J^2W,$$

where t_2 is the temperature shown by the thermometer in the interior of the cylinder, t_1 the temperature shown by the thermometer in the mercury bath, J the amperage of the current, and W the resistance of the wire in ohms. Two determinations of ϵ under very different conditions gave 0·533 and 0·526 small calorie respectively. Preliminary experiments having shown that the walls of the cylinder gradually suffered corrosion from the explosions, and so altered in heat-conducting power, the cylinder was lined with white enamel before the main investigation was begun. The values for ϵ just given relate to the cylinder after being so enamelled.

As it was not possible to work at higher final pressures than 25 to 26 kilos. per square centimetre, the highest degree of compression to which the original gaseous mixtures could be brought was 5·11 kilos. absolute, as measured before the valve leading to the indicator was opened. This opening caused a small reduction in the compression, which was, of course, allowed for. Hence, five series of experiments were performed, in which the original compression was 1·01, 1·90, 2·80, 3·55, and 4·40 kilos. per square centimetre respectively. In each series, the proportion of coal gas in the gaseous mixture varied from about 7 to about 16 per cent. by volume.

The coal gas contained on an average 3·6 per cent. of carbon dioxide, 4·7 per cent. of heavy hydrocarbons, 0·7 per cent. of oxygen, 8·3 per cent. of carbon monoxide, 50·2 per cent. of hydrogen, 29·6 per cent. of methane, and 2·9 per cent. of nitrogen by volume. Its specific gravity at 0° C. and 760 mm. was 0·5641, and the specific gravity of the heavy hydrocarbons in it was 1·975. Its gross calorific value, as determined in a Junkers calorimeter, was 668 B.Th.U. per cubic foot at 0° C. and 760 mm., or, allowing for contraction, 618 at constant pressure. Its net calorific value at constant volume was hence calculated to be 600 B.Th.U. per cubic foot at 0° C. and 760 mm. By calculation from the average chemical composition of the gas, its calorific value appeared to be 576 B.Th.U.; the difference of 4·2 per cent. being due to the errors involved in deducing calorific value from chemical analysis in which all the "heavy hydrocarbons" are estimated together. Determinations of the proportion of carbon dioxide in the explosion products showed that each volume of the total heavy hydrocarbons in the original coal gas required 3·3 volumes of oxygen for their complete combustion, yielding 2·2 volumes of carbon dioxide and 3 volumes of water vapour. The compressed air used in the experiments had the composition of normal air. An amount of 0·2 per cent. by volume of carbon dioxide in it (derived from traces of this gas clinging to the storage cylinder from a previous charge) could be fairly ignored. Estimations of the proportion of nitrogen in the gaseous mixtures fired and in the several combustion products, gave concordant results—indicating that the combustion of the gas in mixtures containing up to 14 or 15 per cent. by volume of it was perfect within the limits of experimental exactitude.

Some Results Obtained.

The five series of explosions at the five different initial pressures already mentioned showed that gaseous mixtures containing 15 to 16 per cent. by volume of coal gas burnt about ten times as rapidly as mixtures containing only 8 or 9 per cent. The effect of the initial pressure upon the velocity of the explosion appeared to be small; but perhaps an increase in the compression slightly hastened the explosion of the richer gas mixtures, and slightly slowed the explosion of the poorer ones. Defining the duration of the explosion as the interval in seconds between the moment of ignition and the moment when the indicator showed the maximum pressure, some idea of the author's figures may be conveyed by those given below.

Initial Compression.	Percentage of Coal Gas in Mixture.		
	8–9	11–12	15–16
1·01 ..	0·236 ..	0·074 ..	0·040
1·90 ..	0·329 ..	0·081 ..	0·025
2·80 ..	0·421 ..	0·073 ..	0·028
3·55 ..	0·353 ..	0·087 ..	0·023
4·40 ..	0·304 ..	0·090 ..	—

These results do not agree well with others that have already been placed on record. For example, some five years ago, Meyer carried out experiments in an engine with a coal gas very similar in composition and calorific power to the material used by Dr. Häusser. Meyer's mixtures contained from 10·1 to 11·8 per cent. by volume of gas; and his explosion velocities ranged from 0·025 to 0·035 second, whereas conformity with Dr. Häusser's results would demand velocities of from 0·085 to 0·125 second. Of course, conditions in an engine cylinder are not strictly analogous to those obtaining in an experimental explosion vessel. The engine cylinder is warm, heats the charge, and hastens the explosion. On the other hand, the charge in an engine is contaminated with the combustion products, which should retard combustion. On the whole, it would seem the moment of maximum pressure shown by an indicator on a gas-engine cylinder does not signify the end of the combustion, which must continue after that moment as the piston travels onwards. This should be true even if the gaseous mixture supplied to the engine is homogeneous. A more rapid combustion is to be obtained by the employment of richer mixtures, and by thorough commingling of the gas and air.

The mean specific heats at constant volume of the combustion products were first calculated from the thermo-chemical data collected during the research on the assumption that no dissociation occurred. Five different calculations were carried out for gaseous mixtures containing from 11 to 15 per cent. by volume respectively of coal gas; three different initial pressures being employed. The averaged results were: For an initial pressure of 1·90 kilos. per square centimetre absolute, 0·420; for one of 2·80 kilos. absolute, 0·3684; for one of 3·55 kilos. absolute, 0·3536. Two similar calculations made for an initial pressure of 4·40 kilos. gave a specific heat of 0·3415. Application of Mallard and Le Chatelier's formulæ to the five different combustion products obtained at an initial pressure of 3·55 kilos. per square centimetre absolute led to an average mean specific heat at constant volume of 0·258. It will be seen that the author's experimental results are much lower than those given by the Mallard and Le Chatelier formulæ, but the former tend to approach the latter as the initial pressure increases. The differences between the results also diminish as the temperatures attained during explosion rise. The Mallard and Le Chatelier formulæ were obtained from experiments at temperatures exceeding 1900° C.—a point which was seldom reached by Dr. Häusser. It is also quite probable that the correction employed by him for the loss of heat during explosion, deduced in the manner previously described, was too small; for the radiating power of a mass of gas

completely filling the cylinder at a medium temperature of from 500° to 900° C., is, no doubt, greater than that of a thin platinum wire at a bright red heat.

The next point studied by Dr. Häusser was the influence exerted upon the explosions of any endothermic reactions taking place simultaneously. It was found that the oxidation of the nitrogen was too small in extent to exert any appreciable effect upon the heat liberated, or upon the mean specific heat of the combustion products. Only when the initial pressure reached 3·55 kilos. per square centimetre did the oxidation of nitrogen become as noticeable in its effects as the loss of heat by passage into the substance of the experimental cylinder. Similarly, the decomposition of the carbon dioxide into carbon monoxide was negligible in a gaseous mixture containing some 15 per cent. by volume of coal gas, and would be of no importance even at temperatures somewhat exceeding those observed by the author. On the contrary, the effect produced by the dissociation of water vapour was found to be serious at temperatures exceeding 2000° C., even when such poor mixtures were exploded as it is customary to use in internal combustion engines.

As the dissociation constant of water vapour has not yet been directly measured, the author calculated it from Bose's value for the electromotive force of a gas cell at 25° C.—*i.e.*, 1·139 volts—using the method suggested some time ago by Preuner and the formula given by Van 't Hoff for connecting the constant with temperature. In this manner, Dr. Häusser obtained the following formula for the dissociation of water vapour :—

$$\log K + \frac{24{,}678}{T} - 3{\cdot}3 \log T + 0{\cdot}000654\, T = 0{\cdot}749$$

$$\text{or} \qquad K = \frac{p_5^2\,(p_2 + 0{\cdot}5\,p_5)}{(p_4 - p_5)^2}$$

where p_2 is the partial pressure of the oxygen, after allowing for the formation of nitric oxide; p_4, the partial pressure of the water vapour in the combustion products if no dissociation occurred; and p_5, the partial pressure of the hydrogen after dissociation. Hence it can be shown that, starting with an initial compression of 3·55 kilos. per square centimetre absolute, the formation of free hydrogen may absorb 7·8 per cent. of the total heat liberated at a temperature of 2030° C., and 13·1 per cent. of the total at 2140° C. With allowance for this amount of dissociation, the mean specific heats of the combustion products at constant volume up to the two temperatures just mentioned are represented to be 0·322 and 0·306 respectively; Mallard and Le Chatelier's formula giving 0·267 and 0·279.

The general conclusions drawn by Dr. Häusser from his investigations are summed up by him as follows.

(1) The duration of the explosion of a mixture of coal gas and air may be said to be independent of the pressure at which it originally exists.

(2) From a comparison of the periods of time occupied by the experimental explosions with those which proceed in an engine cylinder, it would appear that combustion in the cylinder is not complete at the moment when the indicator shows the maximum pressure, even if the gaseous mixture is thoroughly homogeneous; nor, if the proportion of gas present exceeds a certain amount, is it complete at the moment when the piston begins its forward stroke. In this respect the use of more rapidly-burning mixtures would be preferable.

(3) In the explosive combustion of mixtures of coal gas and air, the dissociation of water vapour produces a distinct effect upon the quantity of heat liberated at all temperatures above 1750° C., but the decomposition of carbon dioxide and the formation of nitric oxide are negligible factors.

(4) The increase in pressure accompanying explosion—*i.e.*, the ratio of the initial to the final pressure—is not always the same, but increases with increasing initial pressure.

(5) The experiments demonstrate the accuracy of the Mallard and Le Chatelier formulæ for the specific heats of the combustion products obtained from mixtures of coal gas and air, provided the initial pressure is some 3·5 kilogrammes per square centimetre or upwards, and the temperature attained is above 1800° C. When the temperature or the pressure is lower, the final pressures calculated from the formulæ are higher than those which actually arise.

(6) An application of the simple gas laws (Boyle and Gay-Lussac) to the explosive combustion of mixtures of coal gas and air, with the object of calculating the temperature of explosion from the rise in pressure, shows the specific heats of the combustion products to be a function of the pressure, decreasing as the pressure increases.

A Useful Carbonizing Book.—We have received from Messrs. James Milne and Son, Limited, one of their carbonizing books. It consists of twelve foolscap pages ruled in columns for entering the state of the meter index, the quantity of gas made, in stock, and sent out, the coal carbonized, the gas made per ton, and the number of retorts, with space for remarks as to the coal used per man and per charge, the gas made per mouthpiece, and the cost per 1000 cubic feet. At the foot of each page there is space for a summary and for entering the previous year's figures. The back of each sheet is utilized for illustrating the firm's specialities; and they are bound together in a stout wrapper. The book will be found very useful by managers for recording their working results.

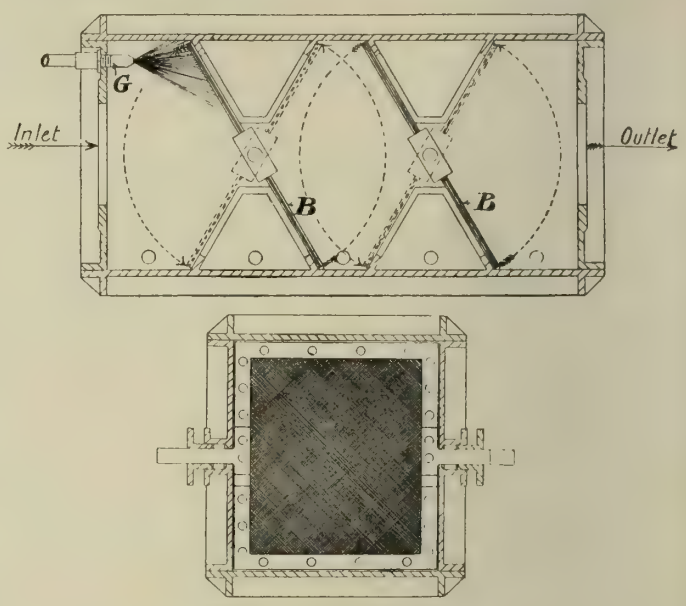
REGISTER OF PATENTS.

Extracting Tar from Gases.

BLAKELEY, W., of Thornhill, Dewsbury.

No. 1257; Jan. 17, 1906.

The tar contained in gases obtained from coal, coke, wood, and other substances is, says the patentee, found to be "very thin," and "difficult to remove with the ordinary washing and cleaning apparatus." Screens used for the purpose quickly get choked up unless the gas is passed alternately through each side.



Blakeley's Tar-Extractor.

The apparatus proposed for the purpose consists of two or more screens B, of wire or other mesh, provided with axles or pivots in the centre, by means of which they can be turned. The screens are in a wrought-iron frame; and they may be turned from the position shown in full lines to that shown in dotted lines (the gas always passing in the same direction through the apparatus). The incoming gas comes into contact with the opposite sides of the screen; and if turned at short intervals backwards and forwards, the gas, of course, passes alternately through each side.

A continual supply of steam at G can, if desired, be arranged to play upon the screens—thus keeping them moist, and also assisting the deposit of the tar.

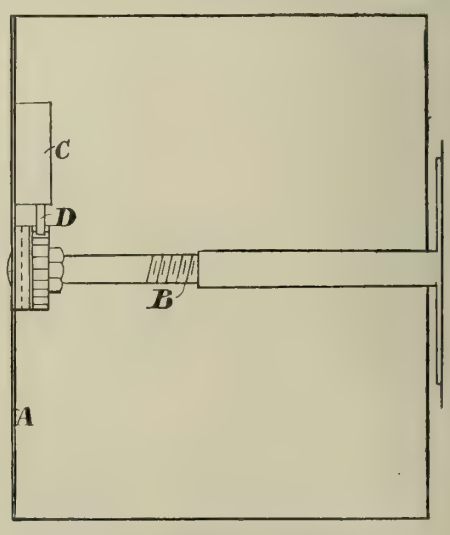
The patentee says he is aware that it has been proposed to use reversible plane screens for separating dust and fibre in apparatus for preparing cotton and other textile fibre; but his invention is distinct from these, notably so in the fact that the direction of the flow of gas is not changed or interrupted.

Device for Preventing Robberies from Automatic Gas-Meters.

PARKER, S., of Bow, and JEFFREYS, C., of Stepney.

No. 2021; Jan. 26, 1906.

This device consists (as shown) of a box or drawer, arranged to fit to existing automatic meters, so as to receive coins passed through the slot. The front of the box is provided with a stout metal plate A, to which is firmly attached a revolvable screw B, which engages and



Parker and Jeffreys' Coin-Meter Lock.

screws into a pipe or cylinder fixed to the hind portion of a case that the box fits into. In this way, the box is firmly held to the case, and acts in combination with the device in order to lock it.

Barker's cylinder lock C (Patent No. 26,003 of 1902) is fixed to the

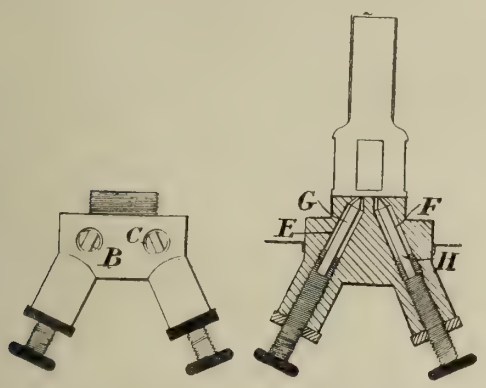
front metal plate; the bolt D being toothed to engage and disengage a cog-wheel attached to the revolvable screw whereby the device is locked or unlocked at the will of the collector.

Gas-Burner Nipple.

ROESSLER, A. C, and AIR-LIGHT COMPANY, LIMITED.

No. 6792; March 21, 1906.

The object of this invention is to provide means for adjusting the proportions of air and gas passing to a burner without the necessity of opening the lamp.



Roessler's Adjustable Gas-Burner Nipple.

Gas and air are led into a cylindrical body through separate passages B C. These passages lead to two inclined passages E F, having their exits (at the burner mixing-tube) comparatively close together. A taper end is provided on each of the inclined passages, and these ends engage with the pointed screws G H, which pass out through the body of the nipple. The adjusting screws are placed externally to the lamp casing; and the quantities of gas and air passing to the burner are regulated by adjusting the screws.

The object of inclining the passages towards each other at their outlet to the mixing-tube is said to be "to obtain a better mixture of gas and air by making the two streams of fluid impinge on one another and form one stream of mixed gas and air which enters the burner."

Strengthening Incandescent Mantles.

HOSEASON, J. H., of Manchester.

No. 9307; April 20, 1906.

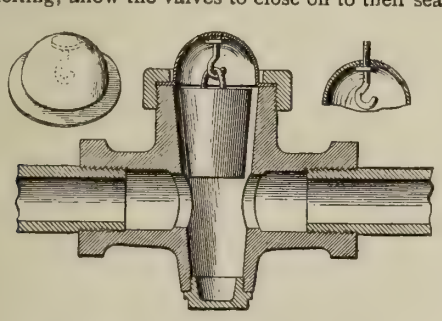
The patentee acknowledges knowing that incandescent mantles have previously been strengthened by folding over their lower edges and also by enveloping them with a cup-shaped net, cage, or basket of platinum or other wire or of asbestos cords, and that asbestos cords have been employed to strengthen suspended and inverted incandescent mantles; also that in an automatic gas-igniter a piece of platinum wire has been employed in combination with an igniting bulb—the wire being hooked over the upper end of the mantle, not over the usual suspension cord or loop, and then carried to the bottom of the mantle and turned under and caused to engage with the lower end of the mantle. Various other arrangements of wire have been likewise used to strengthen the mantles; and so he makes no claim for any such arrangements, but only for special applications of wire: 1. In an inverted mantle, a piece of fine wire bent under the mantle and preferably passed through its sides and having its ends secured to the fireproof ring, or its equivalent, at the top of the mantle. 2. In a suspended mantle a piece of fine wire connected to the cord at the top of the mantle and carried to the bottom and then carried round the mantle itself.

Shutting Off the Supply of Gas in Case of Fire.

JENCZEWSKY, A. W., of Chicago, U.S.A.

No. 13,671; June 14, 1906.

These automatic self-closing safety valves (for cutting off the gas in case a fire occurs where the pipe is laid) consist of fusible metal plugs which, on melting, allow the valves to close on to their seats.



Jenczewsky's Gas Cut-Off.

As shown, the valve-chamber is provided with a dome-shaped thin sheet-metal cap which projects from the body of the valve, and is provided at its top interior portion with a thin layer of fusible metal. The whole of the upper service of the disc, being in contact with the thin metal, is readily melted when any external rise of temperature takes place; and if a valve of the straightway type is employed, the closing of the valve is uninfluenced by the pressure of the gas, whereas, in hitherto proposed devices of this nature, the valve has been of the type that is closed either against or with the pressure. A further feature of the invention is the provision of a pin upon the valve-supporting means for forcibly releasing the valve—the pin projecting through a hole in the dome-shaped cap.

APPLICATIONS FOR LETTERS PATENT.

2090.—LESSING, R, "Extracting cyanogen." Jan. 28.
2158.—HIBBERD, C. E., "Coin-freed meters." Jan. 28.
2201.—CLINCH-JONES, F. J, "Making gas." Jan. 29.
2252.—PETERSON, P. E., "Gas-burners." Jan. 29.
2258.—STILL, W. M., and ADAMSON, A. G., "Incandescent gas-lamps." Jan. 29.
2285,—HUGHES, W. T., "Water-meters." Jan. 29.
2303.—EHMANN, C. P., "Atmospheric burners." Jan. 30.
2330.—POTTER, W. G., "Mantles." Jan. 30.
2408.—DAVIS, E., and YATES, W., "Burner and mantle holder" Jan. 31.
2426.—KEABLE, A. H, and DUCKHAM, A. M'D., "Conveyor-chains." Jan. 31.
2490.—TANCZER, E., "Incandescent burner." Jan. 31.
2500.—GEBR. KÖRTING AKT.-GES., "Water-jet condensers." Jan. 31.
2510.—PRICE, C. W., "Incandescent lamps." Jan. 31.
2527.—BURY, J., "Incandescent burners." Feb. 1.
2534.—GROSSMANN, J., "Treatment of ammonia liquors before and after distillation." Feb. 1.
2538.—SCOTT, W. B., "Supporting gas-lamps." Feb 1.
2563.—WIGLEY, P., and ARCULUS, G. N. & E. A., and WARRY, J., "Inverted incandescent gas-lamps." Feb. 1.
2617.—STILL, W. M., and ADAMSON, A. G., "Gas-lamps." Feb. 1.
2663.—GLOVER, S., and WEST, J., "Regenerator setting for vertical retorts." Feb. 2.
2676.—FELTEN and GUILLEAUME-LAHMEYERWERKE ACT.-GES., "Manufacture of water gas." Feb. 2.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by our Correspondents.]

A Difference in Opinion.

SIR,—I have carefully read your article in this week's "JOURNAL," on "The Beneficiaries of Economy in Municipal Gas Production." You therein praise Widnes for supplying gas to its consumers at a price which practically represents its cost, and unfavourably compare therewith Manchester which applies about £1000 a week derived from gas profits in reduction of rates.

I have no interest in either of these undertakings or localities; but, as a shareholder in a gas company, I am heavily hit by the action of a municipality in another place, who supply electricity at cost price. This makes me look at the matter from another point of view.

By referring to figures for 1905 (which are the latest I have), I find Manchester had invested in its gas undertaking about one and a quarter million pounds. This capital was provided not only by gas consumers, but by the ratepayers generally. It seems to me that the ratepayers who provide the capital of the undertaking are entitled to have a reasonable rate of interest paid to them. The sum of £1000 you mention as the amount which the Manchester gas undertaking pays weekly towards the rates represents about 4 per cent. per annum on the capital belonging to the ratepayers. The gas consumers, therefore, have their gas produced for them under favourable circumstances as regards the profit chargeable in respect of interest on capital; and I am unable to see why the ratepayers should lend the capital free of interest so that the gas consumers should be able to get their gas more cheaply. If there is a loss on any municipal gas or other undertaking, the ratepayers have to bear it.

In the case of the municipality of which I have complained, the principle you praise Widnes for adopting, is applied to electricity, with most unfair results to our gas undertaking.

Wealdstone, Middlesex, Feb. 6, 1907. J. E. LILLEY.

[Underlying our correspondent's disagreement with the position that has been consistently taken up in the "JOURNAL" as to the proper treatment of the revenues of municipal trading undertakings, is the old fallacy that capital is provided by the ratepayers. It is not. The ratepayers are not called upon to put their hands into their pockets for a penny piece for capital. The money used for capital purposes is borrowed money; and the people who lend it are paid their interest and have the principal repaid (assuming the undertaking to be a prosperous one) out of the profits of the concern—and those profits come entirely out of the pockets of the consumers. Why should the consumers pay interest to those who lend the money, and also to others who do not lend money? That is not what is done in ordinary business life, nor by the gas company in which Mr. Lilley is a shareholder; but still our correspondent would have municipal consumers pay interest twice over. If the ratepayers in proportion to their rateable standing were called upon to personally provide from their own pockets the capital invested in a concern, then the position would be altogether reversed. The ratepayers have one responsibility. Should any deficiencies arise, they are called upon to make them good. That is the beginning and the end of their responsibility; and the recoupment of any out-of-pocket expenses under that responsibility ought, in equity, to discharge the obligation of the undertaking to the ratepayers. They have as ratepayers done nothing whatever beyond that to entitle them to reward. But let us keep to the Manchester gas undertaking for

illustration. What do consumers do there? They provide interest on the capital employed, the money required for sinking fund, the money needed for maintenance and renewals, and they pay the undertaking's share of the city rates; and after doing all this (without asking the ratepayers to contribute a penny piece), our correspondent holds that they should pay something in excess for the benefit of those ratepayers who have contributed nothing whatever to the success or to the financing of the undertaking. To make gas consumers contribute something to the rates, after providing for interest and sinking fund upon the capital involved in the business, is indirect and unfair taxation upon one section of the community. A company administered undertaking is in a more fortunate position than a municipally administered one, in that it has not to provide a sinking fund; and yet Mr. Lilley would impose the additional liability of having to provide something for the ratepayers who have done absolutely nothing towards earning or deserving it. The Manchester electricity undertaking does not contribute anything to the rates; and those ratepayers who patronize the electricity undertaking harm the gas undertaking by depriving it of business. Yet there are among the electricity consumers some of the largest ratepayers who derive the greatest amount of benefit from the distribution of the profits of the gas undertaking from which they have withdrawn their support. Again we desire to know, where is the justice of this? If the electricity undertaking referred to by Mr. Lilley meets all its financial obligations from its own profits, then it is doing, by the repayment of principal, one thing more than the local gas company. Where, then, is the gas company injured? They can only be injured by irregularities in management—such as supplying one class of electricity consumers below a paying price, and causing another class to bear an extra part of the financial burdens of the undertaking. Where a municipal electricity undertaking has to fall back upon the rates for support, and take a large sum from the ratepayers for public lighting, that is the result of the concern not being run on business principles. We are opposed entirely to municipalities undertaking work that can be done equally as well, or better, by private enterprise; but we are also opposed to the gas consumers as a section of the ratepayers being bled for the benefit of other ratepayers who have not contributed either to the repayment of principal, the furnishing of the interest on the capital employed, and the placing of the undertaking on a sound financial basis. Such bleeding is really unequal taxation. For these reasons, we cannot agree with our correspondent.—Ed. J.G.L.]

Opening of the Bristol Gas Company's New Offices.

In the "Journal" for Aug. 30, 1904 (p. 600), we gave a view of the new offices then in course of erection for the Bristol Gas Company, of which a few particulars appeared in the preceding issue. The building was ready for occupation at the close of the past month, the staff moved into it on the 2nd inst., and it was opened the following Monday without ceremony, for the use of the public. The situation of the new offices facilitates the transaction of financial business between the Company and the consumers; while in the fine showrooms the latter are afforded an opportunity of inspecting the latest and most improved designs of pendants, brackets, stoves, and other gas appliances. Attention is attracted by the brilliant lighting of the building, both inside and outside. Along the exterior balustrade are four incandescent lamps of 600-candle power; in the entrance lobby is a lamp of 300-candle power; and the central hall is lighted by numerous pendant incandescent mantle lights. In the spacious general offices are eight pendants, each having four lights; and there are ten upright lights, held by brackets, affixed to the walls. These groups of burners are automatically lighted and extinguished. Though the removal was only made on the previous Saturday afternoon, the new offices were in excellent order when they were opened.

A Large Customer for the Derby Gas Company.

Readers of the "Journal" may probably remember that the Midland Railway Company have at Derby their own gas-works, of which Mr. Henry Fowler has charge. We learn that the Company have decided to discontinue the manufacture of gas, and take what they require from the Gas Company. The "Derby Daily Telegraph," in referring to the matter, says the Company are not making an altogether new departure, as in their early days, and for a number of years, they were in the habit of looking to the Gas Company to supply all their needs at the Derby Station, and only commenced the manufacture of gas themselves some 25 years ago. The same paper says the relations between the two Companies have always been of a cordial character; and in the friendly arrangements made between them in past years, the Railway Company gave up to the Gas Company the land on which the Litchurch works now stand. Moreover, part of the plant that has been used by the Railway Company in the manufacture of their gas was originally the property of the Gas Company. In the new arrangements about to be entered into there will not, it seems, be any great hardship involved by the displacement of labour. The change will be made very gradually, and, as a matter of course, the addition of 175 million cubic feet to the present output of upwards of 600 millions will necessitate the employment by the Gas Company of more men, who will naturally be taken over from the Midland. It is believed that no great capital outlay will be necessary on the part of the Gas Company to meet this largely increased demand on their resources.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Feb. 5.

(*Before Mr. Justice* Parker.)

In re Kent County Gaslight and Coke Company, Limited.

The petition of J. R. Carmona and others for a compulsory winding-up order in connection with this Company (see *ante*, p. 352) came before his Lordship again to-day.

Mr. Vanneck said the petition stood over from the previous week, and the petitioners were prepared to assent to it being postponed for another fortnight if his Lordship would allow it.

His Lordship inquired as to the long list of people who had given notice of supporting the petition.

Mr. Eustace Smith said he appeared for them all, as well as for the petitioners.

His Lordship said he thought the petition ought to be ready for hearing in a fortnight, as it ought not to be kept hanging over the Company too long. The uncertainty was disadvantageous to them.

Mr. Smith said his friend's clients were appealing from a decision of Mr. Justice Joyce, on which he (Mr. Smith) relied as part of his case.

His Lordship inquired if the decision referred to was the one under which the names of certain people had been taken off the register, on the ground of misrepresentation.

Mr. Smith said it was. The Company wanted the petition to stand over pending the appeal; but he could not agree to that.

Mr. Vanneck said this was what he should ask when the petition came on, and after they had gone into the facts.

Mr. Smith said his clients did not think the appeal was *bonâ fide*.

His Lordship said the matter might stand over for another fortnight, and then he would see what was to be done.

HIGH COURT OF JUSTICE—REFEREE'S COURT.

(*Before Mr.* Muir Mackenzie.)

Kellett v. Stockport Corporation.

As briefly reported in our issue of Dec. 25 (p. 899), this important action for damages for breach of contract in connection with the construction of water-works for the defendant Corporation was adjourned until the 10th ult.; but, by subsequent arrangement, the renewed hearing began on Jan. 14 and continued until the 29th. The reference has thus lasted over twenty-two days, and the reserved judgment of the learned Official Referee was delivered on the 4th inst.

As before, Mr. A. M. L. Langdon, K.C., Mr. Norman Craig, and Mr. J. A. Spedding (instructed by Mr. Robert Rodgers) appeared for the plaintiff; Mr. W. Pickford, K.C., Mr. E. Sutton, and Mr. C. M. Bailhache (instructed by Messrs. Rawle, Johnstone, and Co., agents for the Town Clerk of Stockport) represented the defendants.

Mr. *Albert Johnson*, the Chairman of the Stockport Corporation Water-Works Committee, was the first witness called for the defendants. Examined by Mr. Sutton, he said Mr. Mansergh's scheme was to give Stockport water at 5½d. per 1000 gallons in substitution of Manchester water at 8d. Mr. Hill and Mr. Hawksley were subsequently consulted. The Corporation came to the conclusion that, on these compressible shales, they could not take the responsibility of building a masonry dam.

In cross-examination by Mr. Langdon as to various letters and conversations between witness, the Town Clerk, and Mr. Mansergh, witness said the Committee were entirely in the hands of the Engineer, in whom they had great confidence. The receipt of Messrs. Deacon and Unwin's reports (forwarded by Mr. Kellett) induced the Corporation to suspend the progress of the works. He could not explain how the Corporation, through the Town Clerk, took up an attitude towards their Contractor that was the reverse of the truth.

In answer to the Official Referee, witness said the Town Clerk must be responsible for the correspondence. Mr. Kellett did not want to vacate the contract; he wanted to go on. They did not want Mr. Kellett to be able to say they had delayed him. They started to spend £248,000, and could not go up to £1,000,000. It would strangle the town. Financial considerations had to be seriously weighed. The Contractor was allowed to go on with the tongue-trench, because Mr. Hill advised that it would be necessary in any case.

In re-examination by Mr. Sutton, witness said the Water Committee had no desire to mislead Mr. Kellett, or to impose upon him in any way. The Committee never interfered until they were satisfied that the masonry dam could not safely be constructed.

Mr. *G. H. Hill*, M.Inst.C.E., examined by Mr. Bailhache, said he had constructed 29 reservoirs in the valleys near the River Kinder. The reservoirs now in course of construction in the Derwent Valley were formed by masonry dams. His opinion was that a masonry dam at Kinder was unsafe, because there were both soft and hard beds of shale. He believed that the fault at hole No. 4 had never been bottomed. The danger was unequal settlement upon a compressible foundation. As to the Contractor's quarries, they were not favourable for getting large stone.

In cross-examination by Mr. Craig, witness thought that the alterations to the original contract were such that reference to the Committee for consent was necessary. On his visits, there was not much of the foundations to be seen, for pumping had been stopped. He entirely condemned the site as unsafe for a masonry dam. He denied having a prejudice in favour of earthen dams. He never paid any regard to

waterspouts, as there had not been any for 60 years. He was not aware of any masonry dam in England where the factor of safety had proved insufficient. He had made no experiments, nor sunk any trial holes, to ascertain the stress in a dam as designed. He knew that if an earthen dam were constructed, instead of a masonry one, the contract would be broken. The question of cost was a prominent one.

After re-examination by Mr. SUTTON,

Mr. *E. P. Hill*, son of the previous witness, was called and examined by Mr. PICKFORD. The great trouble was the different degrees of compressibility. His opinion was that the site was not a suitable one for a masonry dam.

Sir *Alexander R. Binnie*, examined by Mr. SUTTON, said that, in his opinion, the site was totally unsuited for a masonry dam, owing to the subsoil being composed of materials of various degrees of compressibility.

In cross-examination, witness said he had never built a masonry dam.

Mr. *J. W. Madeley*, M.Inst.C.E., examined by Mr. BAILHACHE, said he was Resident Engineer of the Kinder works. His evidence was directed, among other items, to detailed figures of the work. He was cross-examined at length by Mr. LANGDON, and was in the witness-box for three successive days.

After Mr. *S. Youart*, a masonry inspector, had given evidence as to quarry costs,

Mr. *Basil Mackenzie* was called. As a contractors' engineer, he was of opinion that Mr. Kellett had not sufficient plant at Kinder to do the work.

In cross-examination by Mr. CRAIG, witness said he was only on the site once for three hours. He was further severely cross-examined as to the costs of stone dressing and working.

Mr. *James Waddell*, examined by Mr. PICKFORD, said he was engineer to Messrs. Morrison and Mason, Limited, who tendered for the Kinder work. He thought the quarries would not supply sufficient stone of the quality required. He gave the cost of doing different parts of the work. He did not consider Mr. Kellett's sample period (August to November) a fair one upon which to arrive at the cost of his work, because there was no bad weather in it.

In cross-examination by Mr. LANGDON, he admitted that the autumn in Derbyshire was particularly rainy. He went to the site at the request of Messrs. Hill and Sons, and was there about four hours.

Re-examined by Mr. PICKFORD, witness said one hour would be plenty for all there was to see.

Mr. *G. M. Nicholson*, a partner in the firm of Messrs. Northcroft, Neighbour, and Nicholson, quantity surveyors, examined by Mr. SUTTON, said he had gone into the figures of the contract. He did not think the profits made by Mr. Kellett, in the sample period, formed a fair criterion to go upon.

In cross-examination by Mr. CRAIG, witness agreed that he had acted in this case more as an accountant than as a valuer. He had not seen the daily returns. He did not consider they gave a better basis of calculation than the pay-sheets which he had taken. Taking a general average of the weather, Mr. Kellett's selected period to ascertain the cost was not unfair to the Corporation.

Mr. *C. O. Webb*, F.I.C.A., examined by Mr. BAILHACHE, said Mr. Kellett's books were incomplete. His further examination was directed to criticisms of Mr. Cooper's figures, the accountant for plaintiff.

In cross-examination by Mr. LANGDON, witness said he had given about a week or ten days to the examination of the books. He was further asked in detail as to the proper way of calculating profits, and as to items of capital charges, depreciation, &c.

Mr. *Harry Kellett* was recalled and examined by Mr. LANGDON, as to certain periods of the work, and as to its progress and stoppages, prices, &c. During the sample period, there was a stoppage of seven or eight full days.

After cross-examination by Mr. PICKFORD, as to certain actual or estimated figures,

Mr. *Abram Kellett* was recalled, and gave further evidence upon stone working and dressing.

Mr. *J. W. Madeley* was also recalled, and questioned as to the meaning attached to certain phrases in the specification relating to stones and joints.

Mr. PICKFORD, in summing up the case for the defendant Corporation, first dealt with three or four outlying claims, commenting, in opening, upon his not having called as a witness either Mr. Mansergh or Mr. Hawksley. Nothing had transpired to alter the opinions expressed in their reports, which had been put in by the plaintiff's Counsel, and so they had not been called. After dealing with lesser items, the claim of £16,194 for extra work upon the tongue-trench was discussed, as this had been agreed to be left to the Official Referee to deal with on a *quantum meruit* basis. The right plan to arrive at this, Counsel said, was to take the cost and put a reasonable profit upon it, not to take fancy prices. There had been no delay caused to the Contractor; and if there had been, that was within the Engineer's power according to specification. The important questions were: What was the contract? Had there been a breach of it? If so, what were the damages? The contract might mean: The contractor will build a watertight reservoir for £327,000; or the contractor will do the work shown on plans, &c. —the object being to build a watertight reservoir. But there was no implication that the Corporation were under an obligation to order any extra works necessary to make a watertight reservoir. The contract was an impossible one. There was no breach of contract by the Corporation, because the alterations constituted a new scheme.

Mr. LANGDON, in his reply, which occupied from two to three days, reviewed the whole history of the matter. This was a contract to do scheduled work at scheduled prices, with an obligation to allow the engineer to order such alterations as were specified. Various clauses of the specification and several letters were considered. The conflicting evidence of the expert engineers was commented upon. There no doubt was a breach of contract when the Corporation stopped the work. What would have been the natural sequence if the defendants had continued to do their duty?

JUDGMENT FOR THE PLAINTIFF FOR £52,546.

The OFFICIAL REFEREE delivered his judgment on Monday, the 4th inst. He found upon the facts or admissions that on May 12, 1903, Mr. Kellett entered into a contract with the Stockport Corporation for £248,724 15s. 3d., for certain of the work comprised in the specification, and for the execution of such work as might be ordered by the engineer at prices to be fixed upon. The contract price under the first tender was £327,000. On May 22, 1903, plaintiff was ordered to proceed with the work, and he brought down plant to the site, bought 13 acres of land for quarries, and leased other land. The original design showed tongue-trenches at the sides, but not in the centre. Two alterations were made by the engineer during the course of construction; a deep centre tongue-trench was added, and the foundations were deepened. In March, 1905, part of the intended foundations was found to be insecure, and Mr. Kellett so informed the engineer. In April, 1905, Mr. Ernest Mansergh contemplated a different profile; and in the following September he had a scheme to move the dam some feet down stream, to widen it, and to do further excavation, so as to make the dam as economical as security would allow. Between Aug. 6 and Nov. 11, orders were given to proceed with the work according to the amended plans. On Oct. 30, the Corporation stopped all the work except the tongue-trench. On Nov. 18, the Corporation said by giving orders they were not abandoning the contract, and therefore the plaintiff had to be ready to go on with it. On Aug. 2, 1906, the Corporation determined the contract, and revoked the licence to the contractor to be on the ground. Plaintiff's claim was for: (1) Balance of retention money and interest; (2) price of work done since the last certificate was given; (3) damages for delay; (4) value of work on tongue-trench; and (5) compensation for loss of profit which plaintiff would have earned.

The first defence set up was that it was impossible to build a masonry dam on the site. The learned Official Referee found as a fact that it was not impossible to make a stable and safe masonry dam. Never during the construction of the work did it occur to Mr. Madeley or to Mr. Mansergh that there was any impossibility.

The second contention was that this particular contract work could not be carried out, and that the alterations constituted a new contract. This could not be sustained in fact. The engineer under a clause in the specification had the power of varying the contract without reference to the Corporation.

In the third place, it was contended that the Corporation were entitled to rescind the contract by reason of the conduct of the plaintiff. Mr. Kellett had called attention to the bad piece of ground, and he would not hold himself responsible for building on it. But he never refused to execute the engineer's orders; and he repeatedly communicated his desire to go on.

Fourthly, it was said that there was no breach, because the defendants had the right to decline to order further work. The learned Official Referee decided that there was an implied obligation on the Corporation not to interfere with the engineer's orders. The engineer was not the mere servant of the Corporation.

The question of damages was next considered. The general principles upon which the learned Referee said that he acted were to recompense the plaintiff for part performance, and to give an indemnity for the part unexecuted. Contractors' profits were to be arrived at by minute examination into the actual cost. It was the duty of the tribunal to moderate the damages. The various items were then gone into, in order to ascertain the amount of damages to be awarded. As regards the compensation for loss of profit, this depended on different elements—some certain, and others conjectural. The estimate of profit on uncompleted work was almost wholly conjectural. There was a great body of conflicting evidence on the point. Witnesses for the plaintiff said he would have made a large profit. Taking the estimate of the defendants, there would have been a loss. The broad fact remained that Mr. Kellett had been deprived of reaping the benefit of his outlay; and he ought, therefore, to be awarded fair and reasonable compensation. The learned Official Referee estimated the contract price of work not finished at £361,000. This would have cost Mr. Kellett £328,100; leaving a surplus of £32,900. Deducting £3500 for contingencies, there was left £29,400, which was the sum awarded for loss of profits. Mr. Kellett's claim for indemnity for sub-contracts could not be allowed. The other heads of awards were: For retention money, £7571 16s. 10d.; for interest for 6 months at 4 per cent., £151 8s.; for uncertified work, £5475 4s. 11d.; for delay, £3696 4s. 4d.; for tongue-trench, £6252 5s. The total award, with that for loss of profits of £29,400, amounted to £52,546 19s. 1d., for which judgment for the plaintiff was entered, together with the costs of the action and counter-claim, both in Manchester and in London.

A stay of execution was asked for in respect of the item of £29,400; but, under the order of reference, the Official Referee did not think he ought to grant one, as it was not expedient.

Divisional Court.—Tuesday, Feb. 5.

(*Before Justices* PHILLIMORE *and* BUCKNILL.)

An application in regard to the decision above reported was made to-day to the Court as named.

Mr. BAILHACHE said this action came before Mr. Justice Lawrence at the Manchester Assizes, and was referred to be tried before Mr. Muir Mackenzie, Official Referee. The trial had occupied 23 days, and resulted in judgment being given against the Corporation for £52,000 odd as damages. The action was brought by Mr. Kellett against the Corporation for damages for breach of contract to build a large reservoir for supplying the town and neighbourhood of Stockport with water. The Corporation determined the contract, and the main question was whether the determination was rightful or wrongful. This had been found against the Corporation. The damages divided themselves under two heads. First, there was a sum of £22,000 for work and labour done and damages for delay. On this head, the Corporation did not propose to appeal, as they were essentially questions of fact for the Official Referee; and he having found against them, they submitted to his finding. But they did wish to appeal on the general head of breach of contract, the damages in respect of which amounted to £29,000. Upon this there were one or two questions of law to be determined, and he now moved for a stay of execution.

Justice PHILLIMORE: Did you ask the Official Referee for a stay?

Mr. BAILHACHE said he did; but Mr. Mackenzie declined to grant it, as he thought, having heard the action, he ought not to deal with the matter.

Mr. NORMAN CRAIG, in reply to their Lordships as to whether he objected to a stay, said, as regarded the £29,000, any question of law which his learned friend raised might affect *quantum*, but could not affect breach *in toto*; and he would suggest that if a reservation of £10,000 out of the £29,000 were made, it would amply cover any possible contingencies on appeal.

Mr. BAILHACHE said this was not quite so. At the very root of the matter of damages was the question as to what the contractor undertook to do by his contract. Did he undertake to build, in accordance with certain plans and specification, a water-tight reservoir? If he did so undertake, the defendants' contention in the Court of Appeal would be that there was no breach of contract on their part—that the contract as framed was impossible to perform, and that, at the most, the damage must lie where it fell. This would go to the whole of the £29,000. At the Manchester Assizes, the defendants paid a sum of £10,000, as they had in hand upwards of £7000 as retention-money which obviously had to be parted with; and he respectfully suggested that they should pay the difference between the £10,000 already paid and the £22,000, and that there should be a stay of execution on the other question of damage.

Justice PHILLIMORE: Your contention goes to the whole £29,000. Have you any subordinate question to make £29,000 too much?

Mr. BAILHACHE said there were subordinate contentions, the main one being this: There was power in the contract for the engineer to give orders for extras and to vary the contract. The variations in this contract increased the original one by more than 33 per cent.; and one of his contentions going to *quantum* would be that these variations were outside the province of the engineer, and, moreover, that the scheme which was formulated by the extras was essentially different from the scheme arranged and contracted for. The Official Referee had based his decision on the assumption that the orders for variation were rightly given. Before the engineer gave them, the Corporation dismissed him; and the point was made that there was undue interference by the Corporation with the engineer, who, in this respect, held an independent position, and whose duty it was to decide impartially between the two parties. This was a question the defendants desired to debate in the Court of Appeal.

Justice PHILLIMORE: If the plaintiff gets the £22,000, he will not be out of pocket, except as to interest and profits.

Mr. CRAIG: Except in this way, that my client bought 13 acres of colliery land, and had to incur a number of expenses.

Justice PHILLIMORE: Did the plaintiff complete the work?

Mr. CRAIG: No; it was a masonry dam, and at a certain stage the Corporation came to the conclusion that an earthwork embankment was sufficient.

Justice PHILLIMORE: We think there should be a stay of execution as to £12,000.

Supreme Court of Judicature—Court of Appeal.

Application was made on Saturday to Lords Justices Cozens-Hardy and Fletcher Moulton, for a stay of execution in respect of the sum of £29,400, part of the £52,000 odd which had been awarded as damages to the plaintiff by the Official Referee.

Mr. BAILHACHE represented the Corporation.

Lord Justice MOULTON asked whether the only issue was not this: Were the defendants justified, under the re-entry clause, in determining the contract?

Mr. BAILHACHE said the Corporation did not profess to determine the contract under the clause. They determined it on the ground that the contract was impossible of performance; and the question as to whether they were right or wrong depended on the construction of a very complicated contract. If they were right, it went to the whole £29,000; but if wrong, there were still other subsidiary questions arising on the contract which would go towards reducing the £29,000. The Divisional Court had granted a stay to the amount of £12,000; but since that decision was given, an affidavit had been filed on behalf of the defendants to the effect that the whole of the moneys coming under the contract had been assigned by the plaintiff to the Capital and Counties Bank. If the defendants paid Mr. Kellett or his assignees the £23,000, it was reasonable that they should have a stay in respect of the £29,000, having regard to the question of law which went to the root of the whole matter.

Lord Justice COZENS-HARDY asked if the defendants would bring the money into Court.

Mr. BAILHACHE said it was not suggested that his clients could not pay if they should be found liable.

Lord Justice COZENS-HARDY inquired whether the bank would undertake to repay the money should the Court so order.

Mr. BAILHACHE said the difficulty was that the bank was not there represented.

Lord Justice COZENS-HARDY suggested that the application should stand over till Monday—the bank to be communicated with in the meantime.

This suggestion was adopted.

The Court being constituted differently this morning—the Master of the Rolls presiding, in place of Lord Justice Cozens-Hardy,

Mr. BAILHACHE shortly recapitulated the nature of his application.

Mr. NORMAN CRAIG stated that he had been instructed to appear on behalf of the bank.

Mr. LANGDON, K.C., for the plaintiff, submitted that, on any view, some damage must be payable in respect of the breach, and there ought not to be a stay beyond £10,000.

Their LORDSHIPS suggested that it would be just and equitable to pay the money to the bank upon an undertaking to return it in the event of the Court so ordering.

Mr. LANGDON said the effect of this would be practically to cripple the plaintiff. As an alternative proposition, he suggested that the Corporation should retain the whole of the money on undertaking to pay interest at the rate of 1 per cent. over Bank rate.

Their LORDSHIPS thought this offer ought to be accepted.

Mr. BAILHACHE said the proposition was an entirely new one; but, upon the first blush, it did not appear to be an unreasonable one. He would consult his clients. If they consented, the order would go in that form; if not, the matter could be mentioned again.

DELIVERY OF COAL UNDER CONTRACT.

Action by the Edinburgh and Leith Gas Commissioners.

In the Court of Session, Edinburgh, on Wednesday last, Lord Salvesen closed the record in an action by the Edinburgh and Leith Gas Commissioners against the Kinneil Cannel and Coking Coal Company, Limited, of Glasgow, in which decree is asked for £309 15s. 2d. The Commissioners say that on April 8, 1904, the defenders offered to sell to them 6000 tons of Kinneil coking single nuts, at the price of 8s. per ton, delivered in railway waggons at pursuers' works at Granton. Subject to terms and conditions contained in the form of tender filled up and sent by the defenders' Secretary, the offer was accepted by the pursuers. On Nov. 2, 1906, when about 3470 tons had been delivered under the contract, the defenders intimated to the pursuers, by letter, that the contract must be considered as terminated. Since then the pursuers have repeatedly called upon the defenders to implement their contract; but they refuse to do so, or to make delivery of the balance of Kinneil nuts, amounting to about 2530 tons. In order to meet the requirements of their works, the pursuers have been under the necessity of obtaining other coal to replace the balance of nuts which the defenders were under contract to supply; and the price of coal having risen, they have had to buy at an increased cost of 2s. 5d. per ton. The sum sued for is the amount of extra cost which they have incurred in the purchase of this coal. The claim is made under the fifth condition of the defenders' offer, in which they agreed to repay any increased cost or expense, and any other loss which the pursuers might incur through the defenders' failure to deliver the quantity of coal contracted for.

The defenders admit the contract, but say that, by Article 1 of the tender, it is provided that "the coal hereby offered shall all be delivered during the period of twelve months, or such longer period, from the date of acceptance, at the Commissioners' option, in such quantities and at such periods as may be directed by your General Manager, addressed to us, in writing, from time to time." The period of twelve months expired on May 2, 1905. At the date of the expiry of the period of twelve months, the pursuers had only ordered 2600 tons under the contract; and by Nov. 31, 1905, the total quantity ordered was under 4000 tons, the greater part of which had been delivered by the defenders. On a sound construction of the contract, it is maintained, the pursuers were bound to order the whole 6000 tons within twelve months from May 2, 1904, or within a reasonable time thereafter. By failing to order the whole quantity on or before Dec. 31, 1905, at latest, the pursuers were in breach of their contract, and occasioned great loss to the defenders. In these circumstances, the defenders intimated to the pursuers that, in consequence of the pursuers' unreasonable delay in carrying out the contract, they declined to be further bound by it. The defenders have, however, offered to deliver to the pursuers 525 tons; and they repeat this offer.

In answer, the pursuers deny that they were bound, under their contract, to order the whole 6000 tons within twelve months from May 2, 1904, or before Dec. 31, 1905, at latest, or that they were in breach of their contract. They maintain that, prior to November, 1906, they had ordered the whole 6000 tons contracted for.

Fixing a Water-Pipe without Permission.

At the Bristol Police Court, last Tuesday, Frederick W. Jones, an engineer, was summoned for using water for purposes other than agreed upon, and also for fixing a pipe to a communication-pipe without the consent of the Bristol Water Company. It was stated that in March of last year the defendant asked the Company what the price of water would be to supply a gas-engine. An inspector informed him; and defendant replied that he thought the sum named was too much, and he would get his water elsewhere. In October a demand for the usual water-rate was served upon the defendant, and paid; but nothing was said about taking additional water for the engine. On Jan. 14 of this year, two inspectors visited the house and found that the additional pipe had been connected with the tank by means of an indiarubber tube. The inspectors questioned the defendant; and he said he had arranged with a representative of the Company to take a supply for the engine. There was no attempt to conceal the pipes. The defendant's Solicitor remarked that on both summonses there would have to be a conviction; but he thought it clear that no fraud or concealment was suggested. The defendant gave evidence to the effect that he had informed an inspector of his intention to use the water, after he had ascertained the price; and he quite believed he was paying for it. The Magistrates acquitted defendant of any fraud, and fined him merely a nominal sum, as the statute stated that permission must be in writing.

Action against the South Metropolitan Gas Company.—In the King's Bench Division of the High Court of Justice yesterday, Mr. Justice Ridley and a Common Jury had before them an action brought by Mr. George Paterson, a commercial traveller, against the South Metropolitan Gas Company for damages for injuries sustained by him through an explosion caused, as alleged, by negligence on the part of the defendants' servants. This was denied by the defendants. The plaintiff's meter had been disconnected, and was in the cellar of the house he formerly occupied. He went down to the cellar and struck a light, and the explosion followed. The Jury returned a verdict for the defendants, as they thought the accident arose from applying a light to the orifice of the meter. A full report of the case will be given next week.

MISCELLANEOUS NEWS.

PONTEFRACT GAS-WORKS PURCHASE ARBITRATION.

Surveyor's Institution.—Monday, Feb. 4.

(Sir Hugh Owen, *Umpire.*)

This was an arbitration between the Pontefract Corporation and the Pontefract Gas Company in connection with the proposed taking over of the undertaking of the Company.

Mr. A. D. O. Wedderburn, K.C., and Mr. F. N. Keen (instructed by Messrs. Baker and Co.) appeared for the Corporation; Mr. E. Forbes Lankester, K.C., and Mr. R. S. Clease (instructed by Messrs. Warwick, Webb, and Co., and Mr. Claude Leatham, of Pontefract) represented the Company.

Mr. Forbes Lankester, in opening, said that the arbitration arose in consequence of an Act obtained in the last session of Parliament by the Corporation of the Borough of Pontefract, for the purchase of the undertaking of the Pontefract Gas Company. Notice was given to the Company on Sept. 10 last that the Corporation proposed to purchase the undertaking, which meant the whole of the plant, machinery, and business. The district served by the Gas Company was practically the town of Pontefract and the parish of Carlton. The population, which had been steadily increasing, was about 14,000 to 15,000. The Company was a statutory concern under an Act of 1873, and succeeded a Company who were supplying without statutory powers. They were a maximum dividend Company; being regulated under the Gas-Works Clauses Act, 1847. They were unable to pay more than a certain definite amount annually on their capital—any surplus beyond that, excepting for certain matters such as reserve, went to reduce the price of gas. The original capital of £16,000 had all been raised, and the full 10 per cent. dividend had always been paid on this. A further sum of £16,000 had also been raised, and the full dividend of 7 per cent. paid on it. Then the Company had power to raise on mortgage £4000 in respect of each £16,000; but up to the present it had only been necessary to raise £5000 of this £8000—a sum of £2000 at 3½ per cent. and £3000 at 3¾ per cent. The money so raised was convertible into preference or ordinary shares, bearing interest at 5 per cent.; and he suggested that this would have to be taken into account. The actual income which the Company derived from their undertaking was sufficient to pay the interest upon all these classes of capital, and left a very considerable and increasing surplus. In the year ending June, 1906, the profits were £3228, which meant a divisible profit of £3045 10s.—a sum which, in all human probability, they would be able to continue to pay. This figure he should ask the Arbitrator to use as the multiplicand. There had been a steady growth of business from the beginning of the Company. The price had been coming down, and was at this moment at a figure which was somewhat below the average of similar companies in similar towns in similar districts. They were at present charging 2s. 11d. per 1000 cubic feet, which was very considerably below what they were allowed to charge—5s. 6d. Within the last eighteen months, they had been making strides in the sale of gas on the slot-meter system, and the result had been an immediate increase in the profits. The Company were now under more energetic management, and there could not be the complaint that they were not developing the business to the extent to which it was capable. Another point for consideration was the actual condition of the plant and works in their hands. When the matter was before Parliament, these were criticized as being larger than were wanted. Therefore, he contended, no new plant would be required for years. Then a further important point was as to the number of years' purchase. What had occurred to their experts was that the purchase should be put upon a 3½ per cent. basis, and that the figure which the Arbitrator ought to apply to the multiplicand as his multiplier should be 28·57 years; and taking the average of ten years (£2937 10s.), at 28·57 years' purchase, they would get a sum of £83,924. From this there would have to be deducted the £3000 of capital which had not been raised, which left a sum of £80,924. Then there was an allowance of 10 per cent. for compulsory purchase (£8092); making a sum total of £89,016, which was the amount claimed by the Company. The matter was simplified by the fact that the proposal was to buy the whole undertaking—"lock, stock, and barrel."

Mr. *Joseph Taylor*, J.P., the Chairman of the Company, and representing Pontefract on the West Riding County Council, said the works were extremely well situated. Pontefract had trebled in population within the last thirty years. There had been gradual progress since the Company started, excepting during one half year, when they lost the custom of the Union, who installed electricity because they would not pay the Company's price. But they were not pleased with the financial result. The Company had no fear of the competition of electricity. They had kept fully abreast of their consumption; and since the new Manager had been there, the sales of gas had largely increased by the introduction of slot meters, which the old Manager would not allow. They were now in a position to meet all demands for years to come.

Mr. Lankester: Have you been advised that you might introduce plant which would save a larger amount of ammoniacal liquor?

Witness: That is what we contemplated doing.

Anything of this sort which may be suggested would, of course, increase the profits?—Yes.

In your view, are the Company at this moment in a sound condition?—I consider so, quite.

If the Company continue to expand, you may want some extra expenditure in the way of mains?—Not very much; and the £3000 will cover any requirement likely to arise for years to come.

Mr. Wedderburn: You said in Parliament that the £3000 would probably last about ten years?

Witness: I do not remember saying that.

Is it not the fact that since 1902 the total increase in your sale of gas has been 92,000 feet?—I could not speak from memory.

If electric light comes into the borough, it will be a very serious competitor?—If there is a prospect of electricity coming into the town, why do the Corporation want the undertaking? My experience has been that where electricity has been introduced into a town, the gas company prospers.

Mr. Lankester: I believe you have been through that period of certain shrinkage owing to the introduction of the incandescent light, and are now coming round?

Witness: Yes.

Mr. *Laurence Whittaker*, the Manager of the Company, said that the excellent railway service meant that coal could be got cheaper. He described the buildings, plant, and machinery, and said the concern was in good order. He then went on to show that, by more economical working, the profits of the Company would go up. He illustrated this by saying that in 1905 the amount of gas made per ton of coal was 9610 feet, and the amount sold was 8885 feet; while in 1906 the amount made was 10,217 feet, and sold 9421 feet. They had very few complaints as to the gas. The revenue from the slot meters in the last half year was about £390, and the revenue per meter he should put at 30s. per annum.

Mr. Clease, dealing with the quantity of land held by the Company, asked: Is it a fact that the Corporation have applied to the Local Government Board for powers to construct a destructor?

Witness: Yes.

And the piece of spare land of the Gas Company would provide an excellent site for it?—That is so.

Mr. Wedderburn objected to this; remarking that the price of the land should be taken as the value to the seller and not to the buyer.

In further reply to Mr. Clease, witness said the percentage of houses taking gas in Pontefract at present was 50. The customers numbered 1455; and there were 1000 houses yet unsupplied. He did not consider the capacity of the retorts was excessive. The largest output of gas in 24 hours last December was 255,000 cubic feet; and the maximum capacity was 355,000 feet. He thought there was very considerable room for improvement in the business. Assuming that another 400 slot meters were fixed, the revenue from these, worked out on the basis of 30s. per year, would be about £600, and would result in an increased sale of gas of about 3½ million cubic feet. He thought there was a good field for heating stoves, which had not yet been touched. There was likewise a field for heating purposes generally. Incandescent lighting had been adopted throughout the town. So that the damage which could be done to the Company by the adoption of this means of lighting had already been done. This, he thought, accounted for the more or less two or three years' stationary character of the output. As to the electric light bogey, he could not say whether a Company gave notice of their intention to apply for a Provisional Order.

Mr. Wedderburn said a Company proposed to get a Provisional Order; but the Corporation thought it desirable that, if electric light was to come, the control of it should be in their hands. Therefore, they applied for a Provisional Order; and the Syndicate's notice had been withdrawn.

Witness gave further evidence as to the nearness of collieries, and as to the consumption of gas. He said that in 1905 the large consumers took about 7 million feet of gas; and these were only 17 per cent. of the whole.

In further reply to Mr. Wedderburn, witness said the installation of 400 more slot meters would cost about £1000; they would be 3-light meters. In the past, the extra cost had been made up by increasing the price of gas by 8d. per 1000 cubic feet.

Tuesday, Feb. 5.

Mr. *Laurence Whittaker* continued his evidence this morning. He agreed with Mr. Wedderburn that in 1906 the gross profits were £3564, which was about 1s. 8d. per 1000 cubic feet, as against £2878 and 1s. 4·39d. in 1905. Roughly speaking, it was an increase of £700. The increase in 1906 was 3·349 per cent., whereas in 1905 it was 3·960 per cent. Their coal contract ran out next June; but he did not think the price was likely to be less after that date.

Mr. Wedderburn put it to witness that a considerable amount of money was spent on land for which there was only a 2 per cent. return.

Witness replied that he had not gone into the matter; but it was a thing which occurred in all works.

Mr. Lankester: I have promised to call other witnesses who will tell you about these things.

Mr. Wedderburn: Now, as to expenditure on capital and revenue account. You agree that any replacement of works should be out of revenue and not out of capital?

Witness: Yes; but different companies have different ways of doing it.

But the sound principle is one which applies all over the world. If you are putting in a fresh thing which you have never had before, and which is entirely additional, that is capital; if you are replacing an old thing, that is revenue?

Mr. Lankester: Yes; I agree if you are replacing a thing in an exactly similar way.

Mr. Wedderburn next dealt with the mains; and asked if witness would advise a 1½-inch main nowadays?

Witness: Not unless it was for a single consumer.

Or a 2-inch main?—Yes, I should in some cases.

These 2-inch mains you think will never want replacing?—No; I do not say that. I cannot tell how many years it will be before the demand is too big for the main. If the demand does come, they will have to be changed, of course, and there will have to be capital expenditure to replace them in parts.

Has tar recently fallen from 35s. to 15s. 6d.?—It varies in different districts.

But it has fallen heavily; and that affects your bye-products?—Yes.

Mr. Lankester: But the price of coke has gone up, and that helps matters?

Witness: Yes.

Are your mains sufficient for the work you are now doing?—Quite.

At some time or other the mains would have to be increased; and you look to the £3000 of unraised capital as a source from which this can be provided?—That is so.

In further re-examination, witness said the leakage of gas was about 7 per cent.; and he considered this very small. He thought the business of the Company was in a good way. If they had not been disturbed, the business would have developed; and for some years to come they would have been in a position to pay full dividends and reduce the price of gas.

Mr. *S. H. Garside*, architect and surveyor, of Pontefract and Castleford, said he had valued the land and buildings of the Company.

Mr. WEDDERBURN admitted that the buildings, including the retort-house, were substantially built; but he complained that the retorts were out-of-date, and would need the expenditure of capital.

Witness gave his valuation of the land and buildings (excluding the gas-works, but including three cottages away from the works) at £7272 4s. 6d. Nearly half the members of the Corporation were in favour of the proposed dust destructor being erected on the surplus land at the gas-works when acquired. He disagreed with Mr. Wedderburn's suggestion that the value of property was decreasing in Pontefract; on the contrary, it was increasing.

Mr. *Ernest W. Drew*, of Messrs. Wood, Drew, and Co., bore out Counsel's statement as to the capital of the Company. The expenditure that had been charged to capital account was, in his opinion, proper capital expenditure, and none of it was in the nature of revenue account at all.

Mr. CLEASE: Do you remember, when the Bill was before the House, hearing the suggestion that we had improperly charged to revenue certain matters which ought to have been charged to capital account, and by doing so it kept up the price of gas?

Witness replied that this was his recollection of what occurred; but he repudiated the suggestion. He considered that the Company was a progressive one, and would have in future paid, and more than paid, their maximum dividend. Coal was supplied to the Company now at 9s. 9d. a ton, and with coal remaining as low, and having regard to the progress previously made, he was of opinion that the price charged for gas might reasonably have been expected to go below the present price of 2s. 11d. per 1000 cubic feet. He heard the allegations of mismanagement hurled at the Company when the Bill was before Parliament, and, as a business man, he ascribed the recent remarkable improvements to the new management.

Mr. CLEASE said that Mr. Stevenson (the principal witness on the other side), when before the House, agreed that, in a maximum price company, the value of the concern was more than half of its goodwill. He asked witness, remembering this, if it was fair to take the last price obtained by public auction as, to some extent, at any rate, an indication of the value of the undertaking.

Witness replied that he did not think they could do that, because there was considerable fluctuation in the price of gas stocks.

After Mr. CLEASE had pointed out that witness had misunderstood the question,

Witness said that the price obtained by auction would certainly be a much better guide than the price between private buyers.

Mr. CLEASE: In Parliament, did Mr. Stevenson say that, in nearly every case of arbitration, the shareholders of a company compulsorily acquired obtained more than they could sell their shares for in the market?

Witness: Yes.

And inasmuch as the price they could sell their shares for in the market was £84,479, would the price which (according to Mr. Stevenson) the Company will receive as the result of arbitration be more than £84,479?—Yes.

Wednesday, Feb. 6.

On the resumption of the proceedings this morning,

Mr. *W. A. Valon* said that he had inspected the area of supply of the Company. There were three railway stations there, and the district was in the neighbourhood of collieries. The number of consumers in 1906 was 1440, against 1217 the previous year, which was about 50 per cent. of the total number of possible consumers. He should say that probably two-thirds of the remainder might be consumers in the future. This showed that the district was not worked out, but that there were probabilities of development even as it now stood. As to the works being largely in excess of requirements, there was no doubt that the margin was greater than was absolutely necessary. There should be a two years' margin for emergencies; and when works were constructed, they should be built with about, seven years in view. For the moment, however, the percentage of margin was, he thought, larger than it need be. As extensions were made in the future, there was no doubt that regenerative gas-furnaces would be used, and the alteration would pay for itself. He had examined the retorts themselves, and they were in good order. He agreed that they ought to have some plant for the manufacture of sulphate of ammonia, as it was a good source of revenue to a gas undertaking; but it would not require a very expensive plant to make the conditions suitable for its manufacture. He said that, in buying an undertaking of this kind, they were buying the security for the divisible profits. The whole of the loan capital was convertible into share capital bearing interest at not more than 5 per cent. He thought it was fair to say that 5 per cent. on £8000 were profits which might be divided by the Company. These were profits which the Corporation should buy when they took over the concern, less, of course, the actual sum which was being paid as interest upon the mortgages. Some time ago the introduction of incandescent gas-lights affected the Company; but in the last two years this had been made up. If the introduction of electricity followed the usual course, it would increase the consumption of gas. He considered 7½ per cent. of leakage was a very low figure. The pressure on the mains was a high one; and if they were not sound, there would be a greater leakage. Slot meters meant larger profits. There would, of course, be an expenditure on mains if the system expanded; but the works were enough to manufacture for many years to come the gas that would be required. Gas-cookers would also be a future source of revenue. There was no doubt that the Company, if undisturbed, would continue to pay their full dividend for a practically indefinite period. In his valuation, he had arrived at the figure of £2937 10s. as his multiplicand; and he had applied the multiplier of 28 57 years' purchase on a 3½ per cent. basis. In this way he made the value of the undertaking £80,924. Then there should be added 10 per cent. for compulsory purchase, which would bring the total value of the shareholders' interest to £89,016.

Mr. WEDDERBURN first cross-examined on the insertion in the claim of the £3000 loan capital which was unissued, and suggested that witness had never put such an item in a claim before. He did not claim it in the similar circumstances of Morley and Skipton.

Witness replied that he could not recollect the circumstances; but there might have been reasons in those cases which guided him in the direction he took at that time.

Mr. WEDDERBURN: What the Umpire has got to arrive at is to see that each shareholder in the Company gets an income equal to his shares.

Witness: Not the value of the shares only, but the value of the security behind them. If the shares on the market might fetch £5 to-day and £6 to-morrow, the market might be an indication of what the value is; but when you come to realize the security, it must be greater than the value of the shares, because the security secures the payment of the dividend on these shares. Therefore, you must clearly buy the security.

Is not what the Statute says that the shareholder is to have his maximum dividend?—Yes; but you must go further than that. He has also the security by which the maximum dividend is secured.

With regard to the question of the £3000 unissued loan capital, can you give any case other than this in which you have claimed it?—No; this is the first case I have had where there has been anything of this kind to claim, or otherwise I should have claimed it.

In further cross-examination, witness said, as to the 10 per cent. for compulsory purchase, that a considerable sum was generally allowed by the arbitrator—always something, but not always 10 per cent. He must claim 10 per cent. on behalf of the sellers; but it was in the discretion of the arbitrator to say what the percentage should be. He did not know that there was an agitation in Yorkshire, by prepayment consumers, who objected to pay more than others.

Mr. *Henry Tobey*, the Engineer of the Malton Gas-Works, corroborated what had been said by the previous witness as to the Pontefract works being in good condition, well maintained, and in excess of the present demand. The superabundance of works, far from detracting from the value of the undertaking, added to it and increased the security. He considered the style of the retorts was a very common one round the neighbourhood; but they could be altered at little cost nto regenerative retorts at (say) £40 per setting. This would effect a great improvement both in gas and coke for sale. He thought the price of gas was reasonable.

In reply to a question as to the effect of electric lighting competition, witness said that his experience generally of companies in his own neighbourhood was that the consumption of gas had not been materially affected by the introduction of the electric light. He instanced York, Scarborough, Bridlington, and Harrogate, and said he had gathered from inquiries that the effect was not material. It might give a slight check when it first came into operation; but gas finally succeeded in overcoming it, and eventually increased the consumption. He agreed there was a large field not yet developed for the sale of gas. He thought there was a field in Pontefract for four times the quantity of cooking stoves as at present, and also for the development of the slot-meter system. He agreed with Mr. Valon's valuation.

Mr. LANCESTER: Do you regard these shares as equal to a trustee security?

Witness: I do; undoubtedly the security is a splendid one.

Mr. *H. E. Jones*, who was the next witness called, said the works were considerably in excess of present requirements; and this was a most distinct advantage to the Corporation. If it were not a statutory undertaking, he should claim for this surplus a separate sum. The works as they stood justified the capital expenditure on them. The capital expenditure per million cubic feet of gas sold (£848) was not unreasonable—considering the small amount of gas sold, the fact that prepayment meters had only lately been taken up, and that a good deal was represented by the excess works. With an expenditure of about £8000 on the mains, the undertaking could do a business of 60 million feet per annum, instead of the 42 millions at the present time. Allowing 5 per cent. on the outlay, this would bring the dividend down from 1s. 4½d. to 1s. 0¼d. per 1000 feet. The following facts made for the stability of the Company and the maintenance of the maximum dividends: There was a low capital expenditure and a low charge for dividend; the works were substantial, and had ample area for development; there must be considerable addition to the revenue from coin-meters, stoves, &c.; and the works were not only in good condition, but the expenditure shown in the accounts was sufficient. He agreed with Mr. Valon that the number of years' purchase should be roughly 28½; and to this he suggested the addition of 10 per cent. for compulsory purchase. His total valuation was £88,781.

Mr. CLEASE asked witness whether, if the Corporation had to raise £90,000 at 3½ per cent. to take over the Company, it would not be reasonable to compensate the shareholders to the extent of enabling them to obtain an equal income by investing in Corporation stock.

Mr. WEDDERBURN objected to the question.

The UMPIRE said Mr. Clease must agree that there was a difference between the shares of the Gas Company and the Corporation stock, which had the security of the whole of the rates behind it.

In cross-examination by Mr. WEDDERBURN, witness said he was constantly investing for friends in gas stock; and gas stocks, instead of depreciating at present, as one witness had stated, were standing uncommonly well. He maintained that gas stocks were hardening up to a 4 per cent. security, as they were in 1898.

Friday, Feb. 8.

The case for the Company having closed on Wednesday,

Mr. *E. Herbert Stevenson*, called upon by Mr. WEDDERBURN, said that such a sum ought to be provided for each shareholder in the Company as would enable him to get equal terms on equal security. Any sum which enabled the present shareholder to double his income was necessarily a wrong figure. The *crux* of the whole case was the

question of the security of the concern. He had come to the conclusion that a company should not claim in arbitration for those things which they might have done for a long period of years, but which they had not done. For instance, the Company might have made a large profit from the manufacture of sulphate of ammonia; but they had neglected to do so. The year 1906 was their best one, and should not be taken as a basis of the Company's business. First of all, this was due to the exceptionally low price of coal in that year. The average price of coal for ten years was 3·33d. per ton above that in 1906; and this resulted in the expenditure in the latter year of £593 less than the average. It was the general opinion that the price of coal had risen, and would rise, all over the kingdom. Turning to the excessive works, he said it had been claimed that the undertaking was more valuable because of this; but it was quite evident that if, for instance, a gasholder was twice the size needed, the cost of repairs must be more than if it was of normal size. In his opinion, a sum of 2d. per 1000 feet of gas ought to be added to the cost of repairs. The Company would not in the future be able to earn their maximum dividend any more than in the past. In the last five years, they had not been able to earn the dividend in three of these years; and in only one year had they any surplus whatever. Shares in a small gas company such as this could not be regarded as of equal value to first-class commercial shares or of corporation stock. He objected to the statement that gas stocks generally were hardening up to 4 per cent. Sheffield gas stock was as nearly as possible 4 per cent.; but that stood at the very tip-top of all gas stock, and had done so for some period. Just recently prices had rather receded than grown. Every gas company had power to raise the price of gas; but they did not like to do so, because they at once found a reduced consumption. He could not say, of his own knowledge, that the reason why the Guardians left the Pontefract Gas Company and adopted electric light was because the Company refused to reduce the price of gas. He did not think there was a very large field for slot-meters. If they extended their business, they would have to come to Parliament for further capital. The sum that could be raised at present was needed to pay, among other things, the debt at the bank. He denied that there was no overdraft, asserting that it amounted to more than £1000. He did not think the population of Pontefract was likely to increase very much. Excessive works were a burden to an undertaking; and the Company asked for an enhanced value in respect of them, and, in addition, it was a depreciating burden. They were asking the Corporation to pay £22 for every £10 invested in bricks and mortar. Of course, a gas company must always be a little ahead of the demand. These surplus works were what might be called "excess surplus" They were a burden until they came into use, because they were dead capital. He agreed that generally the buildings were in good condition. The retorts were old fashioned. If they had been modern ones, of course, the profits would be increased; but in order to do this they would have to spend fresh capital. The claim made in respect of the small mains was, in his opinion, unprecedented. From an engineer's point of view, all gas-mains under 3 inches in diameter were wrong. Respecting the change made from ordinary to prepayment meters, the ordinary meters would never be used again in Pontefract, and they ought to have been scrapped. He claimed that it was improper to charge the cost of them to capital. It was unfair to regard the old meters as marketable stock. There was a lot of surplus land; and a good deal of the money expended on it must be regarded as dead capital. He calculated that the loss added 1½d. per 1000 cubic feet to the cost of gas. There was practically no reserve fund now; and it was an element of security that there should be a reserve fund. He regarded £60,438 as a fair price to be awarded. This would produce the annual income of £2720 if it was a security on a 4½ per cent. basis. He would add nothing in regard to the conversion of capital, nor for compulsory sale, as was suggested by the Company's witnesses.

In cross-examination by Mr. LANKESTER, witness said that Parliament would have looked at a company suspiciously who had converted their borrowed money into capital—more so now than in 1899. Ossett and Devonport, he thought, were cases in which there was a right to convert borrowed money into capital, and no claim had been made in respect of it. He did not think the maximum dividend was well secured in the case of Pontefract.

Mr. LANKESTER quoted from the speech of Mr. Wedderburn before the Parliamentary Committee, in which he said: "This is a case in which the maximum dividend is well secured." He then asked: Is it your opinion that the difference between a statutory and a non-statutory company is about 1 per cent.

Witness: That is my general opinion.

Is it not a fact that the Company have earned their maximum dividend from the beginning?—I have said that all along. But they have not earned it during the last ten years. We are not buying the profits which the Company earned 20 or 30 years ago. We have to look forward to the future now; and it is only the immediate past which tells us what the profits of the future will be.

Alderman *Charles Lowden*, of Pontefract, also gave evidence, in the course of which he said he should imagine that the surplus land of the Company was one of the worst sites that could be picked in Pontefract for building purposes.

The proceedings were then adjourned till yesterday (Monday).

Carburetted Water-Gas Plant for Nelson.—The Nelson Gas Committee are arranging to erect a carburetted water-gas plant at their Brierfield works, at an estimated cost of £4200. The consumption of gas has been increasing to such an extent that it is absolutely necessary to take some steps in order to meet the demand before next winter comes round.

The Dibdin-Woltereck Gas-Making Process.—According to a paragraph which appeared in the "Financial News" last Wednesday, "negotiations are proceeding at No. 3, Edinburgh Mansions, Howick Place, Victoria Street, and at No. 102, Ashley Gardens, S.W., for the formation of the Dibdin-Woltereck Gas Company. Captain Lomax and Mr. J. Corah are in charge of the preliminary arrangements." The process referred to has already been described in the "JOURNAL."

BRISTOL GAS COMPANY.

A Record of Progress.

The Annual General Meeting of this Company was held in the new offices, Colston Street, Bristol, last Thursday—Mr. J. W. S. DIX, the Chairman, presiding.

The SECRETARY (Mr. John Phillips) having read the notice convening the meeting, the report of the Directors was presented. It was stated therein that the revenue account for the past year showed a profit of £71,966, which, with £39,514 brought forward, made a total of £111,480 available for interest on the debenture stock and dividend on the general capital stock. The debenture interest for the year amounted to £11,824, and the interim dividend on the general capital stock for the half year ended June last to £28,562; making a total of £40,387, and leaving a balance of £71,093. The dividend for the half year to the 31st of December would absorb £29,312; leaving £41,780 to be carried to the credit of the next account.

The CHAIRMAN, in moving the adoption of the report, said it gave him very much pleasure to welcome so large a number of proprietors in their new building. The Directors were pressed by people outside to provide them with more convenient offices than those at Canons' Marsh; but their answer was that consumers were called upon by collectors, and that they need not trouble to go to Canons' Marsh. The reply was that it was not always convenient to pay the collector. When, however, the Canons' Marsh Railway was made, it became obligatory to obtain a site for new offices. There they were now, and he trusted the proprietors were pleased with the premises and their position. Convenience was afforded to customers to pay their accounts, and there was also a show-room—for grates, stoves, pendants, brackets, and so forth—which was one of the best in the West of England, where people might make their choice of gas fittings and appliances. So far as this department was concerned, the Company did not desire to enter into unfair competition with plumbers and ironmongers, but rather to help and encourage them. He believed this policy would meet with the approval of the shareholders. All they wanted to do was to sell gas; and the more they could help local tradesmen to sell their appliances, and thereby increase the consumption of gas, the better the Directors would be pleased. He thought the accounts were very satisfactory. There had been an increase in customers, and in cookers; the former being more than last year by 2905, and the latter by 3366. The progress of the Company from the beginning was shown in some figures he would lay before the meeting. Last Monday week was the hundredth anniversary of the lighting of a certain street in London by gas. Bristol did not begin quite so early. The Bristol Gas Company (St. Philip's) was incorporated in 1819; and the Bristol and Clifton Oil Gas Company in 1823. In 1836 power was taken to use coal; and in 1847 the name was altered to the Bristol and Clifton Gaslight Company. In 1853 the two Companies were amalgamated, under the style of the Bristol United Gaslight Company; and in 1891 the name was altered to the Bristol Gas Company. He had before him a table [see p. 418] showing their progress since the year 1852. It was in 1892 that the day consumption of gas began, and there were sold 435 million cubic feet. Since then the use of gas for cooking and heating had gone up enormously; and he thought the figures were exceedingly satisfactory. They showed the solidity of the concern. When electricity was introduced, some people predicted that it would extinguish gas. But these folk ought not to have prophesied until they knew. People talked about the convenience of electricity, and as to how they could switch it on and off. Well, the same could be done with gas. [A demonstration was given by Mr. Phillips.] Other inventions were in progress; and they did not know yet what they would be. But even at the present time he thought they had reached a fair state of proficiency. Hence gas could compete with electricity not only in lighting, but in other ways; while the difference in expense was very considerable. The Company were in the pleasant and happy position of having earned their dividend and carried over a handsome balance. He thought he ought not to conclude his remarks without alluding to another matter. He did not want to do any croaking; but there was nothing like looking things straight in the face. At present the coal market was in a peculiar state; and if they had to pay a higher price for their coal, they must make provision for meeting the extra charge. Unless they were actually driven to raise the price of gas, they would not do so. They would try every method to continue to give customers cheap gas; and if they should be obliged to raise the price, it would be very much against the wish of the Directors, and would only be done out of sheer necessity, to enable them to meet their obligations.

The DEPUTY-CHAIRMAN (Mr. G. K. Stothert) seconded the motion.

Mr. P. K. STOTHERT referred to the large increase in the rates which the Company had to pay, while, on the other hand, they received £1600 less than last year for public lighting. Therefore, while they paid much more in local taxation, they received a great deal less from the city. In the neighbouring town, with which he was associated [Bath], the electric lighting concern, which was owned by the Corporation, had been trying to make a profit, but had failed. The Corporation were about to part with their works to a Syndicate, who would pay for them a handsome sum, which he hoped would be applied in a reduction of the rates. He was connected with the Gas Company there, and would have to face competition; but he preferred doing so with a private concern than with a corporation-owned undertaking, which had the backing of the rates. He feared, however, it would be a long time before Bristol would part with their electricity works to a Syndicate, though he did not think their accounts were any more satisfactory than those of the Bath concern. If this step were taken, the rates would be relieved, and the Gas Company would be placed in a more favourable position in regard to competition.

The CHAIRMAN replied that the Bristol Gas Company would not object to competing with a private company; but it was unfair to compete with a corporation-owned concern, with the rates at its back. He believed that if the accounts of the Bristol undertaking were properly set forth, they would show a loss, and not a profit. He considered there was room for both electricity and gas. Regarding the smaller

sum received for public lighting, this resulted from the price charged being reduced from 2s. to 1s. 6d. per 1000 cubic feet. The Company tried to get Parliament to make certain changes in their powers; but they would not let them charge one customer less than another. So, having reduced the price to the Corporation, they had to do the same to the public. Consequently, they charged 1s. 6d. per 1000 cubic feet of gas employed for motor purposes, and gave the same advantage to people who, using large quantities of gas, paid their accounts promptly. The latter had an astonishing effect in inducing dilatory people to pay.

The motion was carried.

The retiring Directors (Mr. G. K. Stothert and Rev. P. R. Sleeman) and Auditor (Mr. H. Grace) having been re-elected, a dividend of 5 per cent. per annum for the half year ended Dec. 31 was declared, and the proceedings closed.

After the meeting, many of the shareholders present went over the new offices and inspected them.

The following are the particulars referred to by the Chairman in the course of his address :—

Year.	Capital Expended to Date.	Amount to the Credit of Reserve Fund.	Rates and Taxes Paid during Year.	Coal Carbonized.	Gas Made.*	Selling Price of Gas.†
				Tons.		
1852	..	..	..	..	190	4/6
1862	£255,388	£15,287	£1,294	47,910	389	3/9
1872	369,154	27,173	2,252	74,615	634	3/- to 3/6
1882	697,110	38,143	5,587	109,216	1010	2/10
1892	831,547	49,054	7,359	176,352	1658	2/10
1902	1,158,814	106,470	8,962	239,650	2285	2/3
1905	1,263,047	113,794	10,987	253,987	2489	2/-
1906	1,305,665	116,350	11,886	258,946	2560	2/-
Inc. for Year .	£42,618	£2,556	£899	4,962	71	..

* In millions of cubic feet. † Per 1000 cubic feet.

Year.	Storage Capacity of Gasholders.	Total Length of Main Laid.	Total Meters in Use.	Prepayment Meters in Use.*	Cookers on Hire from the Company.†	Public Gas-Lamps in Use.
	Cub. Ft.	Miles.				
1852	..	..	..	..	..	3004
1862	1,700,000	108	..	..	..	3308
1872	3,400,000	150	15,800	..	..	3732
1882	6,600,000	208	19,916	..	..	5083
1892	8,300,000	264	22,384	20	2,193	6733
1902	15,000,000	338	35,225	6,955	19,560	8943
1905	15,000,000	350½	44,711	13,511	30,327	9217
1906	15,000,000	355	47,616	16,157	33,693	9325
Inc. for Year .	..	4½	2,905	2,646	3,366	103

*Commenced hiring out in 1891. †Commenced hiring out in 1888.

The following figures show the increase in the consumption of gas during the hours of daylight: In 1892, it was 435 millions; in 1902, 924 millions; in 1905, 1043 millions; and in 1906, 1093 millions—an increase last year of 50 millions.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report for the half year ending Dec. 31 last which the Directors of the Company will present at the ordinary general meeting of shareholders on Thursday.

The revenue account shows a net profit for the half year of £64,526 4s. 6d., which, added to the balance of £19,409 17s. 7d. brought forward from last year, produces a net revenue balance of £83,936 2s. 1d. Deducting therefrom £9463 10s. 10d. for interest, there remains standing to the credit of the net revenue account a balance of £74,472 11s. 3d. available for dividend.

The Directors recommend the payment of dividends thereout at the rate of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum on the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year.

The Right Hon. Sir John Colomb, K.C.M.G., and Mr. J. G. Pilcher, two of the Directors, retire by rotation, and, being eligible, offer themselves for re-election.

Mr. S. W. Savage, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 31st of December amounted to £926,405; that £1,076,875 had been added by conversion, making £2,003,280; and that £222,445 remained unissued out of the total authorized (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,598,057 9s. 7d. The expenditure stands at £1,385,244 19s. 7d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,598,057 9s. 7d. There is consequently a balance of £65,139 15s. 2d. carried to the balance-sheet. The expenditure on capital account in the half year was £15,309, apportioned as follows: New and additional mains, services, &c., £3270; stoves, £3029; prepayment meters and fittings (less £6583 written off for depreciation), £9010. The reserve fund amounted to £33,588; and the insurance fund to £32,177. The following is the revenue account.

Expenditure.

Manufacture of gas—		
Coal and oil, including dues, carriage, unloading, and trimming	£91,519 9 3	
Salaries of Engineer and officers at works	2,145 0 0	
Wages (carbonizing)	18,330 15 6	
Purification, including labour	1,723 0 3	
Repair and maintenance of works and plant, materials, and labour, less £299 3s 3d. received for old materials	25,523 18 10	
		£139,247 3 10
Profit sharing		3,135 5 4
Distribution of gas—		
Salaries and wages of officers and rental clerks	£3,620 16 3	
Repair, maintenance, and renewal of mains and services, material and labour	5,998 0 2	
Repair and renewal of meters	2,829 11 8	
,, ,, ,, ,, stoves	6,493 10 1	
,, ,, ,, ,, prepayment meters and fittings.	7,881 0 1	
Incandescent mantle maintenance, &c.	514 0 4	
		27,336 18 7
Public lamps—lighting and repairing.		2,586 10 0
Rent, rates, and taxes		13,184 1 2
Management—		
Directors' allowance	£1,250 0 0	
Company's Auditors	75 0 0	
Salaries of Secretary, Accountant, and clerks	1,183 8 9	
Collectors' salaries and commission	1,639 19 8	
Prepayment meter collection	2,048 12 5	
Stationery and printing	1,004 1 8	
General charges.	1,135 12 3	
		8,336 14 9
Bad debts		1,149 19 0
Law and parliamentary charges		250 2 0
Superannuations and allowances		938 16 2
Official officers		97 19 6
Total expenditure		£196,263 10 4
Balance carried to net revenue account		64,526 4 6
		£260,789 14 10

Receipts.

Sale of gas—		
Common gas per meter at 2s. 5d. per 1000 cubic feet (80,023)	£187,273 13 10	
Public lighting and under contracts, common gas	5,946 15 8	
	£193,220 9 6	
Less discounts and allowances	3,322 7 6	
		£189,898 2 0
Rental—		
Meters (24,257)	£2,878 17 1	
Stoves (45,119)	7,202 15 3	
Prepayment meters (54,968)	12,042 12 11	
Incandescent mantle maintenance	435 10 4	
		22,559 15 7
Residual products—		
Coke, less £4502 16s. 11d. for labour	£28,316 10 7	
Breeze, less £595 6s. 3d. for labour.	2,937 12 2	
Tar	6,722 10 10	
Ammoniacal liquor and sulphate of ammonia	10,280 3 8	
		48,256 17 3
Miscellaneous receipts—		
Rent receivable	£45 15 0	
Transfer fees.	29 5 0	
		75 0 0
Total receipts		£260,789 14 10

The following are the statements relating to the manufacturing operations of the Company in the half year.

Statement of Coals and Oil.

Description.	In Store June 30, 1906.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store Dec. 31, 1906.
	Tons.	Tons. cwt.	Tons.	Tons. cwt.	Tons.
Common	25,975	106,969 10	110,431	515 10	21,998
Cannel	2,508	..	220	..	2,288
Total	28,483	106,969 10	110,651	515 10	24,286
Oil—gallons	396,291	1,002,830	1,086,988	..	312,133

Statement of Residual Products.

Description.	In Store June 30, 1906.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1906.
Coke—tons	3,917	67,773	18,286	49,523	3,881
Breeze—tons.	491	14,222	..	14,058	655
Tar—gallons.	510,131	1,209,088	..	1,040,208	679,011
Ammoniacal liquor—butts	3,315	34,811	29,303	..	8,823
Sulphate of ammonia—tons	85	930	..	968	47

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,721,587	41,813	1,554,869	1,622,504	4080

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil,

&c., £19,124; coke and breeze, £2349; tar, ammoniacal liquor, sulphate, &c., £7619; sundry stores, £31,583—total, £60,675. A sum of £17,978 stands in the balance-sheet as employees' bonus and savings. The figures this time last year were: Coal, &c., £19 141; coke and breeze, £3597; tar, &c., £7717; sundries, £26,476—total, £56,931. Employees' bonus and savings, £12,938.

INVESTIGATION OF STOCKPORT GAS ACCOUNTS.

The question of the method of keeping the Stockport Corporation gas accounts, which has been discussed by the Council on numerous occasions, has now been the subject of a report (see "JOURNAL," Dec. 11, p. 771) by a Special Committee, who were appointed to go into the matter after a Sub-Committee chosen by the Gas Committee had already reported. The Special Committee, after a thorough investigation of the books, find that there have been irregularities in the keeping of the accounts; that the system of book-keeping is not what is required for such an important undertaking; and that in the interests of the Gas Department it was necessary that a new Chief Clerk should be appointed, and that a thorough reorganization of the office staff should take place. They recommended that, in conjunction with the Borough Treasurer, an experienced firm of chartered accountants should be consulted with a view of instituting a proper system of book-keeping; that a new Chief Clerk should be appointed; and that an appointment in another department of the Corporation should be offered to the present Chief Clerk (Mr. Thomas Bedford). When, however, the matter came before the Council, the following amendment was, by 25 votes to 11, substituted for the recommendations of the Committee: "(1) That the Gas Committee be instructed to consult a firm of experienced chartered accountants to advise them, in conjunction with the Borough Treasurer, as to the institution of an approved system of book-keeping. (2) That the present Chief Clerk of the Gas Department be dismissed from his position. (3) That a gentleman of business experience and a full knowledge of accountancy be advertised for and engaged as Chief Clerk. (4) That the Special Committee submitting this report be requested to inquire and further report what suitable appointment (if any) can be offered to Mr. Thomas Bedford in some other department of the Corporation."

COMPARISON BETWEEN MANCHESTER AND SHEFFIELD.

On the Gas Committee's report being submitted at last week's meeting of the Manchester City Council, the Chairman (Alderman Gibson) was asked by Mr. Clyne whether it would not be well for the Committee to adopt the manufacturing and administrative methods of the Sheffield Gas Company. He said he thought Manchester gas should be as cheap as that supplied by a private company.

In reply, Alderman Gibson remarked that he had dealt with a similar question in respect of Sheffield many times before; and he wanted his statement that day to be his final answer. If Mr. Clyne would take the trouble to look at "Field's Analysis" for 1905, which was recognized as the standard work on all gas matters, he would find manufacturing charges (which included salaries, wages, purification, and maintenance of plant) to be as follows: Manchester, 5·59d. per 1000 cubic feet of gas sold; Sheffield, 7·52d. Manchester secured 500 cubic feet of gas more out of every ton of coal carbonized than did Sheffield; and leaving out the cost of coal and the amount received for residuals, they put gas into their holders at a less cost than Sheffield. If Manchester adopted Sheffield methods, Manchester would be worse off. Besides this, Manchester had prepayment meters, which Sheffield had not. Manchester, too, gave free meters, free boiling-burners, free grillers, and free cooking-stoves, which meant giving their customers, and taking out of their profits, £30,000 a year. Sheffield charged for all these things. Again, they gave £1000 a week out of their profits towards the relief of the rates. The fact was, that with what they had control over they did much better than Sheffield. Sheffied paid 4s. per ton less for coal than Manchester, and obtained much higher prices for residuals, owing to local conditions over which his Committee had no control. Sheffield could sell gas cheaper than Manchester, as the result of more favourable local conditions.

The report of the Committee was approved.

A Candid Opinion of Electricity at Newport.

The statement of affairs which Mr. R. Laybourne, the Chairman of the Newport (Mon.) Gas Company, had to lay before the shareholders at the recent half-yearly meeting was of a very gratifying character. He said that during the six months there had been an increase of 5,074,000 cubic feet in the quantity of gas sold to the public, compared with the corresponding half of the previous year, requiring the consumption of additional coal of the value of £12,005. The sale of residuals showed an improvement. As a result of the working for the half year, the Company had carried to profit and loss account £127 more than in the last six months of 1905, which enabled the Board to pay the statutory dividend without recourse to the reserve fund. The number of cookers added during the half year was 774, making the total now in use 10,268; and of gas-fires the number added was 192, making a total in use of 3054. The report having been adopted and the dividends having been declared, Mr. Thomas Canning, the Engineer and Manager, referred to the opposition of electricity, and remarked that neither now nor in the past had he looked upon the matter in Newport otherwise than in the way of so much waste current—for the simple reason that there was a better light to be obtained much more cheaply. Electricity would scarcely have been put in use at all for lighting, except as an article of luxury, had it not been taken up by the municipalities as a sort of foster-child. It had been so taken up for two reasons—viz., because it was new, and because it was expensive. For lighting, for heating, and for cooking gas was holding its own; but it behoved those interested in gas to keep their eyes open to improvements.

NOTTINGHAM GAS CONTROVERSY.

Appointment of the New Committee.

In accordance with the resolution come to last month by the Nottingham City Council—and duly recorded on p. 167 of the "JOURNAL"—"that a Special Committee of five members be appointed to hold a public inquiry into the working of the gas undertaking during the past five years," the names of the gentlemen chosen were submitted to, and approved by, the Council at their meeting yesterday week.

The matter was adjourned in the first instance in order that Alderman Fraser and Sir John M'Craith, the leaders of the two parties in the Council, should endeavour to agree upon the names of those to serve; and the appointment of the Committee was the first business on the *agenda* at last week's meeting. It was announced, however, that although Alderman Fraser was ready with his names, Sir John M'Craith was not; and the consideration of the matter was thereupon relegated to a later stage in the proceedings. When the Council were about to rise, Sir John M'Craith said there seemed to be a great difficulty about the appointment of the Committee; but he would suggest Mr. E. M. Elborne and Dr. Dabell as Conservative members. Alderman Fraser then nominated the Mayor and Messrs. E. L. Manning and S. Cook. Dr. Brown Sim inquired whether the gentlemen named had consented to serve; and though at the moment no reply was made to the question, it subsequently led to some discussion, after which Dr. Brown Sim moved that Dr. Dabell be not appointed till he had given his consent. Mr. Sands seconded this, but it was lost; Alderman Fraser remarking that it was absolutely unprecedented for two of his Liberal friends to object to the appointment of gentlemen nominated by Sir John M'Craith. Alderman Pyott moved another amendment (which shared the same fate), that the appointment of the Committee be deferred for a month—giving as his reasons that it was not required at all, and that it would be almost impossible for it to carry out the duties. The members nominated were then duly appointed.

During the meeting, Sir John Turney said he regretted that he was not present when it was decided in January that another unfortunate Committee should be appointed to take into consideration the affairs of the gas undertaking. He could not for the life of him understand why this thing was not settled long ago. He did think, with all due respect to his friends, that it was a waste of time and a stupid thing to proceed with it. The people in the city did not want to know who had made the blunder in the past, because it would not help those who had control to manage the undertaking on business-like lines. Did they suppose, he asked, that the men who gave evidence before—he would call it—the Select Committee, would give evidence again?

PUBLIC LIGHTING IN THE CITY OF LONDON.

Extended Use of Incandescent Gas.

Since the commencement of the year some changes have been made in the public lighting arrangements in the City of London. The two arc columns by the Mansion House and Lombard Street have been removed, and their place taken by a high-power gas-lamp similar to those in Queen Victoria Street and an ordinary incandescent gas-lamp. The arc lamp on the approach to London Bridge, deemed to be no longer necessary owing to the light from the high-power gas-lamps on the bridge, has also been removed. With the exception of the small piece of arc lighting in King William Street, this completes the ring of high-pressure gas lighting commencing at the Southwark end of Blackfriars Bridge, and traversing Blackfriars Bridge Approach, Queen Victoria Street, Mansion House Street, and Lombard Street, to the Bermondsey end of London Bridge—constituting one of the most magnificent demonstrations of high-pressure gas lighting in the United Kingdom.

In addition to completing the area named, it should be mentioned that the Tower Bridge and Southwark Bridge are similarly lighted by the South Metropolitan and Commercial Gas Companies; while in other areas and at various points and wide crossings in various parts of the City high-pressure lamps are in use, either connected directly with the mains or worked by compressing plants. At the last meeting of the Court of Common Council, instructions were given for constructing a resting-place in the roadway of Fleet Street, by Chancery Lane, with an incandescent gas-lamp thereon; and a recommendation was passed that the City of London Electric Lighting Company be called upon to remove the electric lamp in Fore Street, by Cripplegate Churchyard, and that two double-burner incandescent gas-lamps should be fixed on the adjacent premises.

THE LIGHTING OF OXFORD STREET.

In the "Electrical Review" for the 25th ult., a statement was made that the cost of 81 flame arc lamps now used for lighting Oxford Street, at £20 13s. 7d. per lamp per annum, worked out at "a total for the whole lighting exactly equal to that of the previous inferior gas lighting."

Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company, deals with the statement, in a letter to the "Review," in the following manner: "As I am confident that you desire only to give your readers accurate information, I should like to correct this statement. The charge for the 81 arc lamps amounts to £1675 per annum. The cost of the previous gas lighting was one-third of this amount—approximately £550 per annum. The estimated annual cost of lighting Oxford Street by modern gas-lamps, according to the scheme submitted by my Company, and pronounced by the Council's Lighting Committee (after prolonged and careful inquiry) to be preferable to the electric lighting scheme since adopted, was £1680. The Electricity

Committee fixed their present rate of charge after this Company's quotation had been made public. Their original estimate was £110 higher. The estimate for gas provided for all lamps alight all night. Nearly one-half of the arc lamps are extinguished at 12.30 a.m. A similar arrangement with gas would have reduced the cost nearly £200 per annum. The installation cost of the arc lamps was estimated at over £3400, with an additional £3000 for mains. The inclusive estimate for gas was well under £2000. The decision to adopt electric lighting was arrived at by the Borough Council—in the face of the recommendation of its Lighting Committee in favour of gas as being more economical and more efficient—solely on the question of 'loyalty' to their own undertaking. The borough is, consequently, sacrificing some hundreds a year in order to make a profit (?) on the sale of about £900 worth of current. It is as well that these facts should be put on record for your readers, lest the statements made in your 'Notes,' under a misapprehension, should lead them into misleading others and coming to grief on being faced with the truth."

The Editors of the "Electrical Review," in a note to this letter, say: "The note in question was received from an official source, but obviously the word 'previous' should have been 'proposed.' We understand that the ordinary rates of charge are in force for this service, and taking into account its excellent character and the necessity for good lighting, the installation cost appears to be justified."

GAS v. ELECTRICITY IN POPLAR.

At the Meeting of the Poplar Borough Council last Thursday evening, Alderman P. A. White moved: "That the Town Clerk do forthwith invite the Commercial Gas Company to state fully the conditions and terms upon which they would, if required, undertake to illuminate by gas, with an efficiency equalling, and wherever reasonably possible or necessary exceeding, that obtaining in the roads and streets now lighted by electricity; that such statement do refer, definitely and separately, to the supersession of the existing arc and incandescent (electric) lamps respectively, also to the exclusion and inclusion of the cost of conversion; and that on receipt thereof the Finance Committee do proceed to advise the Council on the financial results which would accrue from an early reversion to the use of gas as the sole illuminant publicly provided for the roads and streets of the borough." Alderman White said there were two points to which he would draw attention—first, that the Council were responsible for the public lighting; and, secondly, that in the near future they would be asked to consider a proposal for a large expenditure in extending the electric light undertaking. The latter would require much investigation. The Council's duty was to save the ratepayers' money; and they should not consider his motion as likely to harm the electric undertaking, because if it was disclosed that gas was cheaper than the electric light, they had a duty to the ratepayers which was greater than that they owed to the electricity undertaking. The duty he referred to was to use the cheapest method of lighting available. The motion was a very moderate one, and did not commit the Council to anything but inquiry. Alderman Green, in seconding the proposition, pointed out that it was most desirable that the Council should be in possession of the information asked for. Mr. Barge, the Chairman of the Electricity Committee, appealed to the Council not to pass the motion. He said that even if they saved money in one way by using gas, they would lose it on the electricity undertaking. Were they to stultify themselves just when there was a probability of the London County Council buying the undertaking if their Bill passed Parliament? Mr. Stephens argued that the electricity undertaking should be considered, quite apart from the Council, as a business concern. It was well known that further capital would shortly be needed for it, and, as a matter of common sense, he suggested that before this was done they should find out if gas was cheaper and better than electricity. As to the suggestion of the Chairman of the Committee that, even if there was a saving on gas, the ratepayers would lose by the reduced consumption of current, he thought it would be generally admitted that if they sold less energy for light they could sell more for power if this branch of the business was pushed. After some further remarks, Alderman White, in reply, said the electricity undertaking had been an absolute and unqualified failure, so far as the supply of light to private houses, for which it had been established, was concerned. All they were doing now was supplying manufacturers with power at low rates, at the expense of the public and a few private consumers. On a division, the motion was lost by 25 votes to 16.

MAIDSTONE GAS COMPANY'S BILL.

The provisions of the Bill which the Maidstone Gas Company are promoting were explained at an extraordinary meeting of the shareholders last Thursday week, by the Chairman (Mr. George Marsham), who remarked that the Board had determined to secure an extension of the limits of supply. A year ago, the Directors had had interviews with the Chairmen of the Parish Councils of Harrietsham and Lenham, who desired the Company to extend their mains to those parishes. The matter had been carefully gone into; and it was found that it was likely to be a remunerative business, especially as Harrietsham and Lenham were well situated with regard to elevation, being 300 feet above the level of Maidstone, and compact villages. The Directors therefore gave an undertaking that they would go to Parliament this year, and obtain the requisite powers. This was necessary because another Company—the Mid-Kent Gas and Water Company—had approached the parishes, and were anxious to supply them, though they could not do so at such a moderate price as their own Company would—namely, 3s. 7d. per 1000 cubic feet, subject to the sliding-scale. The Directors also thought it well to include other parishes in regard to which at present they had no power—Broomfield, Chart, East Sutton, Sutton Valence, Ulcomb, Boughton Malherbe, and Hunton. Sutton Valence had already a Gas Company of its own, concerning which undertaking the Directors were hoping to come to terms for purchase. If they did not, they would strike out the parish of Sutton Valence. While they were going to Parliament, the Directors thought it well also to include a few other matters. In recent years, the strictness of the law as to some of the sulphur impurities had been relaxed; and the Board proposed to take advantage of this, and, without any inconvenience to the consumers, get relieved of certain penalties. There was also a clause as to special apparatus for testing illuminating power, which was in accordance with what the leading Metropolitan Companies had done; and there was a clause to provide for power to lay down pipes for ancillary purposes. Another clause would enable them to connect their works with the railway line. They were in hopes of obtaining the consent of the South Eastern and Chatham Railway Companies; and if so, a short tram-line would be constructed from their wharf to the railway. This would enable them to get their coal by rail, if it should ever be necessary, and to send away their coke or other residuals by the same means. The Directors hoped to get the Bill through Parliament without opposition; and they felt assured that the additional powers would enable them to increase their business on safe lines, and prove of considerable benefit to the Company.

EFFECT ON MEAT OF COOKING BY GAS.

In their issue dated the 2nd inst., the "Lancet" asked whether cooking by gas was injurious to the meat; and they then proceeded to answer this question to the following effect.

Cooking by gas, by the method which is nearest to that known as roasting in front of the coal-fire, is generally conducted so that the meat is exposed to the direct heat of the gas-flames, and the products of combustion sweep the surface of the joint. If the cooking were done by the gas-oven being heated on the outside, it is difficult to see why such a process should be different in any respect from that in which the cooking is done in the ordinary range-oven heated by a coal-fire. The question narrows down, therefore, to a consideration of the effects which the products of gas combustion—whether they be complete or incomplete—are likely to have upon the meat. We may thus count upon the exposure of the meat to small quantities of such incomplete products of combustion as carbon monoxide, acetylene, and sulphurous acid, and to the complete products carbon dioxide, steam, and traces of sulphuric acid. It is well known that during the cooking of meat by whatsoever process, the meat loses weight, or, in other words, there is a constant emission of vapour; and consequently it can hardly be supposed that absorption can be going on at the same time. But assuming that not to be the case, what effect is the bombardment of small quantities of carbon monoxide, acetylene, and sulphurous acid likely to have on meat, and would these effects render the meat less suitable for food? Both carbon monoxide and acetylene form molecular combinations with the colouring matter of the blood; but then at the high temperature of the cooking process, it is hardly conceivable that such a combination could take place, besides which a plentiful supply of air would prevent either carbon monoxide or acetylene from being permanently absorbed. The minute quantity of sulphurous acid would tend to bleach the colour of the meat; but as a rule no effect of this kind is observed. If sulphuric acid is formed, this at a high temperature might possibly char slightly the surface of the joint. All such speculations, however, are strongly discounted by the fact that meat during its cooking is emissive, and not absorptive. As to steam and carbonic acid, it is questionable whether they could have any depreciatory chemical action at all. The conclusion seems inevitable, therefore, that any differences that are shown between meat cooked in front of the fire or in an oven next to the fire and meat cooked in a chamber containing gas-flames inside, must be due entirely to physical, and not to chemical causes. In a word, the explanation must lie in the different manner in which the heat is applied in the different circumstances. It should be borne in mind, however, that in cooking by gas the meat is exposed to a rapid current of steam derived from the combustion of the gas; whereas in the range-oven the only steam present is that which comes from the meat itself; while in open roasting in front of the fire there is no atmosphere of steam round the joint at all, the air is free to play over its surface, and the cooking is done by radiated heat. We believe the process of open roasting is far superior to that of close roasting. The flavour of the meat so cooked is invariably better; and the tissue itself is generally more tender, when it is cooked by roasting, and, consequently, more digestible.

We are inclined to put forward the view that the cooking of meat by gas is less satisfactory than cooking by the open roast method, because in the former case the joint is cooked partly by ascending heat currents and partly by steam. According to this view, cooking by gas may be regarded as a hybrid process—that is to say, part boiling or steaming, and part roasting. The constant stream of steam over the surface of a joint of meat is calculated to extract some of its flavour, and to exert a toughening effect on the tissues of the meat. We do not think, however, that any difference between the effects of gas-cooking and cooking by roasting or in the range-oven can be regarded in a serious light from a point of view of dietetics. The differences, in our opinion, are due entirely to different physical conditions under which the meat is cooked; and we may, we think, safely exonerate the gas-cooker from any suspicion of poisoning the meat by reason of the escape of unconsumed gaseous products from the gas-flame. The process of grilling meat exposes that food to a torrent of incomplete products of combustion compared with what happens in the gas-cooker; and yet a grilled chop is very popular—"the taste of the grill" (the sulphurous acid, and perhaps a little smoke) being held in esteem; but the gases round the chop in this case do not contain anything like the proportion of hot aqueous vapour which is present in the gas-cooker.

Dorchester Gas-Fittings Company, Limited.—At the meeting of this Company to-day, the Directors will recommend a dividend of 6d. per 10s. share (7s. paid) for the year ending the 31st of December last, which will leave a balance of £155 to be carried forward.

SIR GEORGE LIVESEY AND GAS COAL PRICES.

[From the "Newcastle Daily Journal," Feb. 11.]

We have the following communication on this subject from a correspondent interested in the coal trade: "Sir George Livesey and others have been exercising their minds lately about the high prices they will have to pay for gas coals this year; and I note that the 'JOURNAL OF GAS LIGHTING' seems to be Sir George Livesey's echo in this matter. Sir George Livesey is a very able man, and has undoubtedly been the strongest power that the producers of gas coals have had to deal with in the gas industry. Many years ago, he made it his business to obtain parliamentary sanction to an arrangement by which he undertakes to supply London consumers with gas on a sliding-scale—ignoring altogether the fact that the cost of producing coals (which is the raw material for gas making) is going up year by year. Since that time he has always failed to recognize that there should be any increased prices paid to the coal producers in comparison with the increased cost of production. Now, what are the facts? For many years the London Gas Companies bought their coals below cost price; and it is only owing to the booms which take place from time to time that the coalowners have been able to get any interest upon their capital. Bearing this out, I am in a position to state that the average price paid by Sir George Livesey, during the last 21 years, to the gas coalowners in the North of England under his contracts (including both depressed and boom years) was 7s. 9d. per ton f.o.b. This represents at the pit 6s. 3d. per ton, and delivered in London c.i.f. 11s. per ton. Can any reasonable person say that this is an exaggerated price? Sir George is apparently quite content to go on at low figures when prices are unremunerative to the coalowners in order that his shareholders may profit; but he soon raises a hullabaloo when prices are advancing, owing to the great demand for coals all over the world, which enables the coalowners to recover interest for depressed years, and to increase wages to compensate the workmen for low wages during depressed years. Doubtless Sir George is under the impression that all coalowners make large fortunes; but this, unfortunately, is the exception, as it is admitted by all experts who have examined the question that for the last 20, 50, or 100 years, without taking into consideration the capital lost by pits having to be closed, the return on coal investments has not exceeded 5 per cent. per annum. If Sir George thought it to the interest of his Gas Company, he would not have hesitated to have shown his usual enterprise by opening out a coalfield of his own. As to combination, there is no combination whatever among the coal producers in the Durham and Yorkshire districts at present; but is it not well known that Sir George Livesey has been always in close conference with various gas companies with the avowed object of keeping down the prices of coal?"

GAS IN LONDON IN THE EARLY FIFTIES.

As we have recently been calling attention to the centenary of the lighting of Pall Mall by gas, it may be permissible to refer to an incident in connection with the gas supply of the Metropolis which took place nearly fifty years later, and which was deemed of sufficient importance to be pictorially described at the time in the "Illustrated London News." A few of the more elderly of our readers may possibly remember the position of the various Gas Companies in London in 1848, who, with their total capital of about £3,500,000, and prices ranging from 6s. to 7s. per 1000 cubic feet, rested in fancied security from attack. This delightful feeling of tranquillity was disturbed by the appearance of a new-comer, who proposed to supply gas at a maximum price of 4s. per 1000 cubic feet. This Company—whose title was the "Great Central Gas Consumers' Company"—secured the services of Mr. Alexander Angus Cross, put up works on Bow Common, and, in the face of much opposition, began to supply gas. The new Company, of which Mr. Dakin, the tea merchant, was the Chairman, had from the first the countenance of the City; and on the 9th of July, 1853, the works were visited by the Lord Mayor and Sheriffs in state. Our illustrated contemporary gave in the next issue a view of the works, with the state coaches and the gold-lace coated footmen in the yard. The various processes connected with gas manufacture were explained by Mr. Croll (who was then one of the Sheriffs) to the visitors, among whom were the City Solicitor (Mr. Charles Pearson), several members of Parliament, and a considerable number of merchants and City men. After inspecting the works, the company went over Mr. Croll's alum manufactory, and in the evening dined at the Brunswick Tavern at Blackwall.

The event has a certain interest from the fact that the writer of the account of the visit gave some particulars in regard to the works. He said that their producing power was 800 million cubic feet per annum, and that they had cost £210,000, one-seventh of which had been spent in law. Works of such magnitude had never, he believed, been constructed for "less than three times the amount." The mains were nearly 70 miles in length; the four gasholders could store about 2 million cubic feet of gas, "produced by retorts placed in two rows of arches, the one over the other, each upper arch containing six clay retorts, and the under arch seven of iron, and each retort producing on an average 8000 cubic feet per day." The heating of the retorts was done by "fires only 7 inches wide by 28 inches long," which the writer was given to understand was "only about one-fourth of the size generally in use." What struck him as being an ingenious and wise expedient for "getting rid of one of the abominations generally connected with gas-works was the use made of the offensive coal tar. Instead of being permitted to accumulate and pollute the air, it was carefully stored in tanks, and introduced into the fire as fuel to heat the retorts." Each section of these, we are told, occupied a space 8 ft. by 19 ft., and carbonized from 10 to 11 tons of coals, producing about 100,000 cubic feet of gas, per day. The writer was greatly struck with the "massiveness and simplicity of the works." The Company, as may be remembered, was amalgamated with the Gaslight and Coke Company in 1870.

On another occasion, according to the publication already alluded to, the Lord Mayor formally opened the new gas-meter factory of Messrs. Croll, Rait, and Co., in the Kingsland Road. After inspecting the building, his Lordship visited the lower fitting-room, which was handsomely decorated for the occasion, and in which dinner was served at tables extending the whole length of the spacious apartment on both sides, with a cross table at the head. Here his Lordship addressed the assembled workmen and their wives in a speech of considerable length, detailing the origin, progress, present position, and prospects of the manufacture of gas.

THE DEEP BORING FOR WATER AT LINCOLN.

Report by the Engineer.

In the last number of the "JOURNAL" (p. 364), it was stated that the Water Committee of the Lincoln Corporation had decided, after an interview with Mr. Percy Griffith, M.Inst.C.E., the Engineer under whose advice the above-named work has been carried out, to continue the boring an additional 180 feet into the sandstone, and thereby complete the scheme originally contracted for. The statement made to the Committee verbally has been put by Mr. Griffith into the form of a report addressed to the Mayor and Corporation; and it came before the Council last week.

It will doubtless be remembered that when the boring reached the water the latter was found to be unsuitable for a public supply; and the problem awaiting solution was as to whether or not the undertaking should be abandoned. Mr. Griffith points out that this depends upon the evidence available with regard to the prospects of failure or success respectively. But he considers it would hardly be denied that to abandon a scheme upon which upwards of £20,000 has been spent, and more than five years of time occupied, while there is any reasonable prospect of success, would be regrettable in the extreme. He thinks the facts and opinions he can bring forward will show clearly that unless the boring is continued to a total depth of 2200 feet, it cannot be claimed that the Committee have done everything possible to render the scheme successful.

With these introductory remarks, Mr. Griffith proceeds to deal with the geological aspect of the problem. He points out that the main factor governing the question of boring deeper is, of course, the nature of the strata immediately below the level now reached—viz., 2015 feet from the surface; and in order to consider this matter clearly, it is necessary to decide upon some datum which is common to other borings of which records are available and also to that at Boultham. Fortunately, there is no difficulty in deciding on such a datum; the base of the Keuper marl having been indisputably proved at 1561 feet below the surface at Lincoln. At the date of his report of 1899, only two sections of the strata in the Lincoln area were available—viz., those at Scarle (or Collingham) and at Gainsborough. Since then borings have been carried out at Haxey (South Carr) and Scunthorpe; and as the base of the marl is clearly shown in each case, Mr. Griffith appends the following tabular statement, giving the thicknesses of the sandstone and its principal subdivisions for purposes of comparison.

—	Gainsborough.	Scarle.	Haxey.	Scunthorpe.
	Feet.	Feet.	Feet.	Feet.
Sandstone ? Keuper	315	205	609	667
Pebble beds	400	319	437	197
Soft sandstone	75	223		not proved
Total	790	747	1046	864

In the cases of Gainsborough and Scunthorpe, there is considerable doubt as to whether the borings actually reached the base of the sandstone; but the evidence is ample to prove that a total of at least 750 feet of sandstone may be expected at Lincoln; and as the boring has reached a depth of 454 feet in the sandstone, Mr. Griffith thinks it is clear that a further depth of at least 300 feet may be confidently expected. In this opinion he is supported by an eminent geologist.

On the subject of analytical data, Mr. Griffith says that the figures quoted in a postscript to his report of Dec. 13 last, show a remarkable similarity between the water first obtained at Gainsborough and the present supply at the Boultham boring. Since that report was written, he has found that the proportion of combined chlorine was much less at Gainsborough than it is at Lincoln; the figures being 2·4 grains per gallon in the former case and 34·33 grains in the latter. However, he gives another tabular statement showing the relative results obtained at Gainsborough and Lincoln (from first and from subsequent samples respectively) and at Scunthorpe; and he suggests that it indicates a probability that the lower portion of the sandstone at Lincoln will yield an improved quality of water, as was the case at Gainsborough. He thinks the fact that the outcrop of the sandstone west of the city is considerably higher and of larger area than it is west of Gainsborough, readily explains the circumstance that the flow of water is so much greater in the former case. At Gainsborough, no water was met with until the sandstone had been penetrated 20 feet; and no considerable supply was obtained until a further 255 feet of boring had been carried out. The water-level at Gainsborough never rose higher than 15 to 20 feet below the surface; whereas at Boultham, he estimates that if the well lining were continued sufficiently high, the water would rise to a height of 60 or 70 feet above the surface. He is therefore very confident that, having obtained so large a flow of water from the hard sandstone rock, almost devoid of pebbles, already penetrated, a much larger flow will be obtained when the thicker beds of pebbles are tapped; and, the main channel for the water being through the pebble beds, he suggests that by tapping them a supply of water will be obtained which has not been in contact with the marls or is affected by the mineral salts dissolved therefrom.

Having stated facts and theories bearing upon the initial question, Mr. Griffith claims to have shown that the abandonment of the boring under present circumstances would not be justified; but he recognizes

that it is further necessary to show that no greater expenditure of time or money is involved by the alternative of resuming the boring. The initial step is to penetrate the sandstone to a further depth not exceeding 185 feet—this representing the depth included in Messrs. Chapman's contract. This will involve an outlay of £1250 if the original diameter of 12 inches is adhered to, or of £1550 if the diameter is enlarged to 24 inches, in accordance with the decision of the Committee. As, however, it is particularly desirable that further work of a purely experimental character should now be restricted within definite limits, he is prepared to advise that, should no improved results as to quantity or quality be obtained when the boring reaches a depth of 2200 feet, the scheme should be finally abandoned, so that an alternative one may be undertaken forthwith.

Mr. Griffith next deals with three possible contingencies which may arise as the boring proceeds. First, should the surface flow of water materially increase, but no improvement take place in the quality of the water, he recommends a further spell of pumping—say, not to exceed one month—which he estimates would involve an expenditure of £750. If no improvement resulted from this, he would then advise the abandonment of the scheme. Secondly, should the quality improve but the surface flow show no increase, the Committee will be in the position of having an available supply of at least 600,000 gallons per day pumping at a depth of 200 feet (as already proved); and he estimates that by pumping from a depth of 300 feet this would be increased to not less than 1 million gallons per day, and at 400 feet a probable yield of from 1½ to 1¾ million gallons. As in this case a question may be raised as to the cost of pumping from such a great depth, he gives some figures on the subject. From actual tests at Gainsborough, the cost of fuel when raising the water 270 feet to the surface and 100 feet above it (in all 370 feet) was proved to be at the rate of 2⅛d. per 1000 gallons; and with a head of 400 feet to the surface and 200 feet above (total 600 feet), he estimates the cost of fuel at the rate of 3d. per 1000 gallons. Thirdly, if any considerable increase of the supply is obtained, and the quality of samples is appreciably better than that of the present supply (either before or after the month's pumping previously recommended), he thinks it would be well worth while inserting steel tubes in order to shut out the present supply from the upper sandstone; and he suggests that if, in the course of the further boring, a band of marl is met with, the diameter should be reduced in order to provide a ledge on which to bed the tubes. The cost of 500 feet of tubes would be about £1500; but he is very confident that an increased flow of water from the lower sandstone would itself shut out the water from the upper beds, and so render tubing quite unnecessary.

As it has been suggested that the boring, even if successful in other respects, could never yield sufficient water to provide a complete supply for Lincoln, Mr. Griffith, in conclusion, deems it desirable to deal with this point as clearly as possible. In the first place, the scheme has from the first been undertaken with a prospect of a maximum yield of 1 million gallons per day; and as more than this quantity is now available, it would hardly be reasonable to abandon the outlay already involved, if the quality of the water should ultimately prove satisfactory, even without any increase in the yield. He personally anticipates a considerable increase in the yield, and will be much surprised and disappointed if it is not possible to obtain at least 2 million gallons per day from a depth not exceeding 300 feet. This would more than equal the present maximum day's demand; and with the new service reservoirs now decided upon, and occasional assistance from the gravel pits and Hartsholme Lake, the available supply would serve for several years to come without having any recourse to the Witham supply. A second scheme would be necessary, under any circumstances, within a period of from five to ten years; as, though he agrees that it might be possible to obtain 3 million gallons of water per day from one particular site in the Lincolnshire limestone, this would involve such an expenditure in constructing deep-level adits, and would also drain such a large area around the works, that, for many reasons, he believes it would be preferable to duplicate the pumping-stations.

Further Boring Operations Sanctioned.

At the Meeting of the Lincoln City Council last Tuesday—the Mayor (Col. J. S. Ruston) in the chair—the Water Committee reported in their minutes that they had resolved that the Engineer be instructed to resume the boring at Boultham until the further order of the Committee, but in any event to a depth not exceeding 2200 feet; and that specimens of the cores be submitted to Professor Hull from time to time for examination. Mr. Newsum moved the adoption of the minutes, and said the appliances for deepening the bore were then being got ready, and the work would commence next day. Mr. Livens suggested that, in carrying out the work of deepening the bore, the Council should fix a limited sum to be expended, in accordance with the estimate of the Engineer. He felt that, considering the very great amount the bore had already cost, they would do well not to throw good money away over what he thought would prove to be bad. They had already exceeded the estimate by 50 per cent.; and therefore he would move that the further expenditure to be incurred should not exceed £1250. Mr. Kilmister was of opinion that the Corporation should not spend another penny on the work; and he proposed that the deepening of the bore be not proceeded with. Mr. White did not agree with this. He thought they should go deeper if there was any chance of getting water. Mr. Newsum said it was proposed to go 185 feet farther down; and the Committee had passed a resolution in such terms that they could stop the work after £500 had been spent, if there was no hope of reaching suitable water. Mr. Foster thought if they had been advised to go to a depth of 2200 feet, the Committee should go to that depth, even if it cost more than the estimate. What was the good of going to within 50 feet or so of the estimate, and then giving up the work? The experts would then say they should have gone to the depth estimated. In the end, the minutes were confirmed with the exception of the recommendation as to the boring; it being decided that the sum of £1250, apart from the reinstatement of the plant, should not be exceeded. It is to be hoped that some definite conclusion will now be arrived at.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In an article in the "Dundee Advertiser" of yesterday, it was stated: "In Dundee last night complaint was general of the failure of the gas supply. In many instances, particularly in the suburbs, the diminution in the supply was so great that no light could be got for a time; and practically in every building where the illuminant is used the light was reduced to a mere flicker. Shopkeepers all over the city experienced difficulty in conducting business, and had to enlist the aid of the humble penny candle. In private houses it was quite impossible to read a newspaper unless it was held close to the burner. This state of affairs lasted for about an hour. When Mr. Yuill's attention was called to the matter, he immediately proceeded to the gas-works, and had the defect remedied. But naturally it was some time until the normal conditions of lighting were re-established. Mr. Yuill informed a reporter last night that the trouble began in the region of the works, and permeated to the suburbs. As to the cause, he was not prepared to dogmatize until he had conducted a further investigation into the matter. At the monthly meeting of the Town Council last night, reference was made to the failure. Mr. Ferguson asked the Convener of the Gas Committee as to the gas that evening. . . . Mr. Stevenson said he only heard of the matter when he came to the meeting, because he saw no appearance of it in the district in which he lived. . . . It would be thoroughly investigated, and the Committee would be informed of the facts at an early meeting." To-day, in the same newspaper, it is stated: "In connection with the breakdown of the gas supply in Dundee on Thursday evening, a preliminary and searching investigation has been made into the whole circumstances. Ex-Bailie Stevenson, the Convener of the Gas Committee, along with Treasurer Urquhart, visited the works yesterday afternoon, and interviewed the Manager, Assistant-Manager, and other officials. It transpired that the cause of the trouble was the lowering of the illuminating power of the gas coming from the retorts, as indicated on the photometer, caused either by too much air being pumped into the gas, or too much of the dregs from the retorts being drawn in. Temporary arrangements were made for preventing a recurrence of the trouble; and it was deemed advisable to call a meeting of the Gas Committee to deal with the matter. This meeting will, it is expected, be held on Monday afternoon, when a report will be submitted by the Manager."

In the Dundee Town Council on Thursday, the subject of the lighting of the thoroughfare of Overgate was introduced by a petition from shopkeepers and others, asking that the street be lighted by electricity. The petitioners considered that if, as was reported to them, gas was to continue to be the illuminant, they would require to take steps to have their just demands. Mr. Don, in support of the petition, said he supposed they were all at one in the opinion that if there was any street in the town that should be well lighted it was the Overgate. He contended that, before the Gas Committee came to the decision to light the Overgate with intensified incandescent gas-lamps, at a first outlay of £70, and an annual cost of £106, they should have consulted the Electricity Committee. He moved that the subject be recommitted, to allow a conference thereon to be held between the Gas and Electricity Committees. This proposal, after discussion, was agreed to.

We know now, through the proceedings which took place before Lord Salvesen in the Court of Session on Wednesday, and reported in another column, that the dispute which has arisen between the Edinburgh and Leith Gas Commissioners and the Kinneil Cannel and Coking Coal Company, Limited, has been brought about by the non-delivery of coal under a contract. The decision of the case will depend upon the Judge's interpretation of the documents which constituted the contract, with the custom of the trade to clear up doubtful points.

The Scottish Juniors got through a lot of business in Glasgow to-night. The paper by Mr. R. A. Campbell, upon "The Laying-Out of Gas-Works," gains in value when it is realized that it is practically a description of how the gas-works at Provan were laid out; Mr. Campbell having been engaged upon that work during the whole period of their construction and being still on the staff in the works. The inception of very large works may be an abstract intellectual operation. Their detailed location and physical construction require more severe application; the governing considerations being more numerous and much more exacting than the process of drawing to scale. When we have had two years' operation of the Provan works, and know how well they have fulfilled the intention of their designer and the expectations of the Gas Department, a narrative of the method in which their laying-out was approached must be of more value than if the works were not of dimensions so commanding, nor so conspicuously successful. Mr. Campbell rather held himself in, in the treatment of his subject; but in doing this he was able to give a short, simple, and enjoyable paper. Mr. P. M'Dougall's paper on the "Carbonization of Coal for the Manufacture of Coal Gas" was upon a subject which is of prime importance in the operation of gas-works after they are laid out and erected. It is a subject which possesses many phases, from the simpler and older forms to the more modern and complex. Mr. M'Dougall treated of the latter. Few possess the knowledge of the higher branches of the subject which Mr. M'Dougall has; and few have had the opportunities of acquiring that knowledge which he has had, under Mr. W. Blair, of Helensburgh, who is a leading authority upon gaseous firing. It is Mr. M'Dougall's disappointment that the subject is not better understood and more studied; and in his paper he strove to give a lead to those who desire to make themselves better acquainted with the invisible causes and effects that are to be met with in the higher branches of retort-house working. Both papers were well received, and led to a long discussion, the outstanding feature of which was that the views put forward seemed to appeal more to the seniors; from which the inference may be drawn that the papers were pitched in a key higher than the Juniors can tune up to.

Last Sunday evening, shortly before eleven o'clock, an explosion took place in the subway carrying the electric cable in St. Nicholas Street, Aberdeen. Three manhole covers were blown off, and from one of the manholes a large volume of flame rose into the air. No one was injured. Immediately before the explosion occurred, the electric

light in the centre of the city suddenly went down. After the explosion it was discovered that an electric light wire had fused and ignited an accumulation of gas in the subway.

At the monthly meeting of the Dunfermline District Committee on Tuesday last, it was explained that the work of putting in the puddle trench of the reservoir at Glenquay, from which a wide district, including the new Naval base at Rosyth, is to be supplied, was going on. They had excavated to 160 feet. The Contractors—Messrs. J. Young, Limited—had submitted rates which, in their opinion, were necessary for the completion of the puddle trench. It was agreed to have a conference on the subject with the Contractors, Sir Wm. R. Copland, M.Inst.C.E., the representatives of the Admiralty and the Inverkeithing Town Council, in order, if possible, to arrange for the completion of the trench on satisfactory terms. The Water Committee have recommended that Sir Wm. Copland be paid £1500 as his commission under the contract. To meet this, and the additional outlay in connection with the extra depth of the trench, it was resolved to apply for power to borrow a further sum of £60,000.

CURRENT SALES OF GAS PRODUCTS.

Week ending Feb. 9.

The demand for tar products in the London market has been good. The price of pitch has rallied, and is distinctly firmer. It is reported that 27s. 6d. has been bid for London pitch for next season; but makers are not at all disposed to sell just now, having already got rid of a large part of their production for the whole year. Crystal carbolic acid is perhaps hardly so firm, and 60° crude stands at from 1s. 8½d. to 1s. 9d. per gallon. Very important sales of ordinary London creosote have been made at from 2¼d. to 2½d. per gallon net at makers' works, according to position. The latest done in 90 per cent. benzol is 1s., usual terms. Solvent naphtha is very firm; and business has been done at 1s. 10½d. for the best quality. Sulphate of ammonia is quiet, but steady, and the demand is expected to be brisker within the next few days—the price on Beckton terms being £12 3s. 9d. to £12 5s. for this and next month.

LIVERPOOL, *Feb.* 9.

Sulphate of Ammonia.

The large makes, being for the most part sold in advance, continue to be taken against contracts; so that, although we are in the season of greatest production, available supplies have been in limited compass, and the market has again shown a hardening tendency notwithstanding unfavourable weather over the greater part of Europe. The closing quotations are £11 17s. 6d. per ton f.o.b. Hull, £12 to £12 1s. 3d. per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. Home buyers have been very quiet. In the forward position, buyers have not been much interested unless at something near prompt prices; but £12 5s. per ton is reported to have been paid for March-April delivery.

Nitrate of Soda.

This article is very quiet at 11s. 3d. to 11s. 9d. per cwt., according to quality, for prompt delivery.

LONDON, *Feb.* 9.

Tar Products.

There has been little alteration in the market for tar products during the past week. Pitch is firm, but with prices unchanged. Business has been done on the east coast at 25s. to June; and on the west coast, manufacturers have offered to sell at 24s. without success. In Manchester, business has been done at 23s. 9d., and in Liverpool at 24s. 6d.; but in each case for delivery some little time forward. In South Wales, makers of fuel appear to be well bought, and will only entertain business either to September or to the end of the year, and report having purchased for the former period at well under 30s. On the Continent, business is practically impossible for delivery this side of June; while for August-December, it is only possible to obtain prompt prices, and these figures dealers will not entertain at present. Creosote is firm. Some quantity of outside makes could be secured in London at 2d. per gallon; but the first-class London qualities could not be purchased direct at anything under 2⅛d. to 2¼d., while in some cases even higher figures are asked. Some quantity of oil was sold in the North at 2d. for delivery over the next six months; but in the Midlands very little is obtainable, and nothing under 2⅜d. would be considered. Solvent naphtha is steady, though it would doubtless be possible to buy upon the east coast at 1s. 1½d. In London, nothing could be secured at much under 1s. 4d.; while for very fine 95 per cent. quality, over 1s. 6d. is said to have been paid. Benzol, 90 per cent., is quiet. Business is reported in the Midlands at 8⅝d., naked, at manufacturers' works; but against this, business has been done at 10½d. f.o.b., casks included, on the east coast. In London, some quantity could be secured at 11¾d., though generally makers ask 1s., at which price they sell small amounts from time to time. Fifty-ninety per cent. is steady, and also scarce; and what little quantity offers, commands the full market price. Toluol is firm, but there is little offering; while pure is very scarce indeed. There is no alteration in carbolic acid, and prices remain the same, though one or two prompt parcels have been purchased at good figures by dealers who made sales some time ago and are now short. In crystals, the market remains unchanged, and there is little business doing in same. There is no change in anthracene.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 25s. 6d.; east coast, 25s. to 25s. 6d.; west coast, 23s. 9d. to 24s. 6d. Benzol, 90 per cent., 10½d. to 11½d.; 50-90 per cent., 11d. to 11½d. Toluol, 1s. 1½d. to 1s. 2½d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1⅛d. to 1s. 4d.; heavy naphtha, 1s. 2½d. to 1s. 4½d. Creosote, London, 2d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2½d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £6 to £9 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

Markets have been fairly well maintained during the past week, and there is a fair inclination to buy for prompt delivery; but dealers at present are not disposed to pay the premium asked by makers for forward. The principal London Companies are well sold, and will not consider anything under £12 5s. for whatever quantity they may have to spare between now and June. Other makes have, however, been placed at considerably under this figure. In Hull, the market may be taken as about £12 for prompt and £12 2s. 6d. for February-June. In Liverpool, business has been done for prompt at £12 to £12 2s. 6d., according to quality. In Leith, dealers refuse to offer more than £12 2s. 6d., which price makers will not give any consideration to, as they are well sold.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 396.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- } 10 p.c.	28—29	..	4 16 7
51,810	10	,,	7	mouth Gas } B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	and Water } Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262—267	..	4 13 8
300,000	,,	,,	9½	Do. New	203—205	..	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	232—237	..	4 14 11
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9½	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—93	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	110—112	+1⅛	4 9 3
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	108—111	..	4 10 1
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	124—127	..	5 2 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	Jan. 31	11	European, Ltd.	24—25*	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18—19*	+½	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas- } 4 p.c. Ord.	96—98	−1	4 9 9
2,600,000	,,	,,	3½	light } 3½ p.c. max.	90—92	..	3 10 1
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 13	3	Coke } 3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	181—184	−1	4 7 0
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	(67½—163½	..	4 3 1
144,140	Stk.	Sept. 13	7⅝	Maidstone 5 p.c.	145—150	..	5 1 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3¾	Monte Video, Ltd.	11½—12½	..	5 12 0
1,775,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	110—111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅜—14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7¾—8½	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	58—58*	..	4 13 0
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12⅜	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
70,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,600	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	127—129	−1	4 5 3
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
112,533	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham } A 5 p.c.	127—130	..	5 0 0
388,020	,,	,,	5	and } B 3½ p.c.	104—106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton } 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Aug. 15	8	Wands- } A 5 p.c.	—	..	—
255,636	,,	,,	6⅛	worth } B 3½ p.c.	140—145	..	4 9 8
75,000	,,	,,	5⅝	and } C 3½ p.c.	113—115	..	4 17 6
79,416	,,	Dec. 28	3	Putney } 3 p.c. Deb. Stk	79—82	..	3 13 2
729,875	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	104—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.	122—125	+1	4 0 0
193,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 [illegible]

Prices marked * are "Ex div."

COAL TRADE REPORTS.

Lancashire Coal Trade.

Everywhere throughout the country where coal pits exist trade is at its best. The advance in prices has not diminished, but seems to have increased, the demand. At any rate, whatever the cause, there is a general clamour for coal of all kinds, and apparently an equal difficulty in meeting it. The ordinary output has for some time past been unequal to meet current orders; and stocks have been depleted. The removal of the export duty on coal has led to an increase in the orders from abroad. Large quantities are being shipped at Hull for the Continent. If the present hunger for English coal is not soon assuaged somewhat, the natural result will be to again raise prices. Gas undertakings are feeling the strain, and paying more for gas coal and cannel. Quotations on the Manchester Coal Exchange are as follows: Best house coal 14s. 6d. to 15s. 6d., secondary 13s. 6d. to 14s. 3d., common 10s. to 12s. 6d., burgy 8s. 10d. to 9s. 6d., best slack 8s. to 9s., medium 7s. 6d., common 6s. 9d. to 7s., coal for bunkers and export at the Manchester Ship Canal 10s. 6d. to 11s. 6d. Furnace coke meets with a good demand at prices ranging from 17s. to 24s.

Northern Coal Trade.

There has been considerable interest felt in the results of the tenders for coal for Sweden; the outcome being a disappointment—due to the fact that so much coal was refused by the Swedish railways owing to the high prices that were asked. Whether later tenders will end in acceptance, is still to be seen. As to the steam coal trade, prices are firm, on the basis of about 14s. 6d. to 15s. per ton f.o.b., for best Northumbrian steams, and from 12s. 6d. to 13s. for seconds. Steam smalls are steady at about 7s. 9d.; and the collieries are generally very busy for this season of the year. In the gas coal trade, the deliveries are now full; but the pressure of the demand seems to be a little less. Durham gas coals are quoted from about 12s. to 12s. 9d. per ton f.o.b., according to quality; and for the very best kinds, it is said that 13s. has been paid. As to contracts, the tenders have been sent in for the coal for the Stockholm gas supply; and it seems to be expected that the bulk of them will be allotted to the usual collieries. The price is believed to be somewhere about 12s. 6d. per ton f.o.b., but much depends on the allowance for freight. Gas coal, however, seems to show a little more quietness, possibly with the passing of the heaviest home demand of the season. Coke is steady, and there is some variation in the quotations for gas coke; but from about 13s. 6d. to 14s. per ton f.o.b. may be looked on as current North Country prices.

Scotch Coal Trade.

Prices continue to advance, which is a sign of the existing activity in trade. The demand for export is very strong; and the quantity of coal which is being taken up by iron-works is also very large. The prices quoted are: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. to 12s. 6d., and steam 11s. to 11s. 3d. The shipments for the week amounted to 259,257 tons—a decrease of 1949 tons upon the preceding week, but an increase of 9386 tons upon the same week of last year. For the year to date, the total shipments have been 1,055,910 tons—an increase of 26,448 tons upon the corresponding period of 1906.

A Proposed Gas-Coal Combination.

Alluding to the question of a gas coal combination, the "Sheffield Daily Telegraph" last Wednesday said: "The arrangements for the formation of a Gas Coal Combination, to which we referred some little time ago, are proceeding apace; but the latest reports regarding the movement are hardly so favourable. The Notts and Derbyshire collieries, it is stated, are desirous of working together, with Lancashire and Yorkshire to do the same. This division has possibly arisen owing to the difference in the 'sperm' values of the coals; but whatever may be the outcome of the present negotiations, there is no doubt that the folly of low prices for gas coal is being forcibly brought home to collieries this year, as in many cases the difference between the prices of gas coal and the present market price which could now be obtained for the same quality of coal for house-fuel purposes is about half."

A gentleman connected with the coal trade, on being questioned by a reporter of the "Standard" on the rise in the price of coal, remarked that as the gas companies' new contracts would have to be made somewhere about March, he thought it very likely that the result would be an increase in the price of gas. Sir George Livesey was thereupon approached on this point; but he told the "Standard" interviewer that he thought "it would be very unwise to say anything about it at the present time."

Under the heading of "The Coal Boom," the "Yorkshire Post" last Wednesday made the following remarks: "West Yorkshire, along with other coal-producing centres, continues to participate in the boom that set in a few months ago. The position of the gas coal branch is unusually strong for this time of the year. Shippers are unable to obtain all they want; inquiry after inquiry yesterday not being satisfactorily met. The Leeds Gas Committee are in the happy position of having contracted for all their requirements up to June; but the Chairman (Mr. George Ratcliffe) and some of his colleagues have been in the market buying four 'small' parcels, totalling altogether 12,000 tons. The prices given are understood to be very satisfactory from the ratepayers' point of view, having regard to the position of the market."

Cost of the Chester Water Case.—The Chester Board of Guardians having lost the legal action in which they were recently engaged with the Chester Water-Works Company (as recorded in the "JOURNAL," pp. 42, 229), are now being called upon to pay the penalty of defeat in the shape of law costs. At their last meeting, a letter was read from the Solicitors, asking for £1000 on account of out-of-pocket expenses, which included £747 for Counsels' fees, £101 for the shorthand notes, and £142 for witnesses. The Chairman (Mr. T. Butler) remarked that when they began the dispute it was said by a member of the Board that it would not cost the ratepayers much over £80. Experience had, however, shown that it had cost thousands. It was decided to forward the cheque asked for.

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Llandrindod Wells Gas Bill.

When the Llandrindod Wells Urban District Council met to decide what action they should take in respect of the Gas Bill to be promoted in the ensuing session, the Clerk reported that the promoters had agreed to practically all the protective clauses which the Council had asked for; but this was on the clear understanding that the Bill was not opposed. Several councillors said they had been informed that Mr. David Davies, M.P., had offered to sell the existing electric light works, with all rights and privileges, to the Council at cost price, *plus* interest not exceeding 6 per cent.; the option of purchase to stand open for five years. A letter was handed in confirming this offer, which, however, was stated to be contingent upon the Council lodging a petition against the Gas Bill. While agreeing that the offer was a generous one, the opinion was expressed by some of the members that, as the Gas Company had met nearly all the Council's wishes, it would be hardly straightforward to now lodge a petition against the Bill. As the result of a vote on the question, the Bill will not be opposed by the Council.

Surveyors' Evidence.

Mr. G. Humphreys-Davies has replied to the letter of Sir George Livesey in "The Times," on the above subject, to which reference was made last week. Sir George, it may be remembered, expressed his inability to understand the meaning of the phrases "the amount of a valuation depends upon the purpose for which it is made," and "the value of the same thing necessarily varies according to the basis upon, and the purpose for, which it is made." Mr. Humphreys-Davies says: "Sir George will find my meaning if he will ask himself what is the value of the South Metropolitan Gas-Works to his Company, what is the value at which they stand in the Company's balance-sheet, what would be the value he would put on them if the County Council wished to purchase them, what value he would put on them for the purpose of rating, what price he would ask if some public body wished to acquire (say) a strip of 5 acres through the centre of the works for the purpose of constructing a railway or public road, and to what extent the value of the monopoly given to his Company by Parliament affects the value of the land that they acquired under their Acts. The statement of fact which Sir George makes affords evidence of the injustice of the charge which has been made, because, although *ex parte*, it shows that the surveyor was so anxious to avoid litigation, with its attendant risk and expense, that he advised his clients to accept the sum which was offered. The statement is otherwise immaterial to the question. But I may suggest that there is nothing immoral in asking a larger price than one is willing to accept, or in offering less than is demanded; because that is the basis upon which the markets for all commodities are conducted, and upon which even Sir George acted. We do not know why £22,000 was asked for the land which was acquired for £15,500; but I think that now they have acquired that land, his Company and their surveyor would, and quite properly, take a very different view of its value if some other public body obtained powers to take it from them."

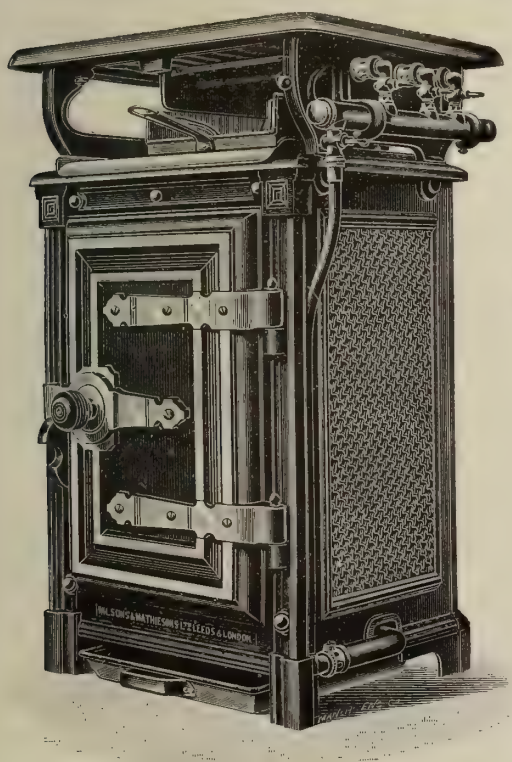
Expensive Street Lighting at York.

Presiding at the half-yearly meeting of the York United Gaslight Company, the Vice-Chairman, Mr. James Melrose, remarked that the report and balance-sheet showed steady progress in the business; and, after paying their maximum dividend, they were able to recommend an addition to the reserve fund of £500, and to carry forward £377. Referring to the further extension of the electric lighting of the streets of the city—which, he said, was still in progress, notwithstanding the fact that it had been shown conclusively that incandescent gas was by far the cheaper and more efficient light—he reminded the shareholders that during 1905, with the object of bringing the street lighting of the city up to date, the Company converted all the gas-lamps from flat-flame to incandescent. With a view of proving their contention that the Corporation were not justified in putting the ratepayers to the extra cost involved—and the Company were payers of rates to the amount of over £2700 a year—a most careful estimate had been made of the difference in cost between the electric lamps now fixed in the city, as shown by the Corporation Year-Book, and the Company's incandescent gas-lamps, with the result that the increase to the present time was between £600 and £700 a year. In fact, it was just double the cost of the displaced gas-lamps. This extra cost, they must bear in mind, referred only to about one-tenth of the public lighting of the city. So far as efficiency was concerned, it was admitted that the streets were not so well lighted by electric lamps as they could be by the Company's incandescent gas-lamps. They asserted that they could, at half the cost, light the city better than the Electricity Department; and, if the Corporation would give them a fair and equitable arrangement, they were prepared to meet them in that spirit. Provided the terms were reasonable in other respects, they could probably make concessions in the price of gas, or by lengthening the time of lighting, which would be to the benefit of the ratepayers.

Increased Water-Rates at Liverpool.—The estimates of the Liverpool Water Committee, which have been adopted by the Council, provide for a water-rate of 7½d. in the pound in the city and Bootle, and 10½d. for places beyond. Last year's charges were 6d. and 9d. respectively; but the figures now returned to are those that were in force four years ago. Whereas the receipts in 1903 amounted to £83,176; in 1905 they were only £54,291.

The Retort-House Litigation at Belfast.—It has been resolved to carry out, at a cost not exceeding £1000, a suggestion put forward by Mr. James Stelfox for the erection of a ventilating chimney shaft and wrought-iron connections in the new retort-house at Belfast which is at present affected by an injunction obtained by a firm of linen manufacturers, who brought an action for nuisance against the Corporation. The legal proceedings in connection with the injunction have involved an outlay of something like £3000; and as the building represents about £40,000 of property, the Committee are naturally anxious to make as full use of it as possible.

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Charge to Prepayment Consumers at Leeds.

A resolution has been defeated by the Leeds City Council, which had for its object a reduction in the charge made to prepayment gas consumers as from July next. The proposer (Mr. H. Watson) said his point was that, as the users of prepayment meters paid cash, it was unfair to charge them an extra price for their gas, and for them not to get any equivalent to the discount which was allowed to the ordinary consumers. The Chairman of the Gas Committee (Mr. G. Ratcliffe), however, declared that no man of business principles could support the resolution. Leeds, he said, made a less extra charge than any other place in the country; and if the price were reduced to the users of automatic meters, the Gas Department would be speedily loaded with meters from ordinary customers, who would want automatic meters in place of them. Mr. Wilson advised Mr. Watson to withdraw the proposition. He had, he remarked, heard the question debated for fifteen years. The fact was that none of the small accounts paid the Corporation; and that being so, there was really no case for a reduction of price. It was asking the ratepayers as a whole to give benefit to a section. Mr. Clarke, on the other hand, contended that when plant became antiquated or out of date, the charge should be one against the whole undertaking. The gas accounts showed that a reduction could be made to the small users; and he therefore supported the resolution.

Consumption of Water in Manchester.

According to statistics prepared by Mr. W. Blackstock, the Secretary of the Manchester Corporation Water Department, the daily consumption of water has increased from 35 million gallons in 1905 to about 38 million gallons at the present time. Much of this, it is pointed out, is due to the boom in trade; but beyond the legitimate call in that direction, and the increased demands from local authorities in the area of service, there is an unaccounted-for consumption. In January, 1906, what is called the public supply of water was actually less than in January, 1905, though in the month just concluded that section of the output was nearly ¾ million gallons more daily as compared with the first month of 1906. The increasing application of water-carriage for the sewage of the city is, of course, a constantly enlarging factor in the consumption; but it is thought that a great amount of waste is taking place. At any rate, the existing condition of affairs is viewed with some alarm by the Water Committee. Steps are, as is known, already being taken for the laying of the third pipe from Thirlmere; but if the present growth of consumption is maintained, the fourth and fifth pipes will very soon be needed, so as to bring the amount from that source up to the maximum of 50 million gallons a day, in addition to the 23 million gallons a day from Langdendale. In 1880, the daily consumption was under 18 million gallons, or less than half that of last year. In 1900, a daily average of 32 millions was reached; and for the next two years there was a falling off, succeeded by more than a recovery in 1903, a very slight increase the next year, and a jump to 35 million gallons in 1905.

Writing Down Halifax Gas Plant.

At last Wednesday's meeting of the Halifax Town Council, the Gas Committee recommended that the present book value of certain plant at the gas-works be reduced from £67,077 to £36,160, and that this sum be debited to revenue account at the rate of £3616 per annum. Alderman Smith, the Chairman of the Finance Committee, said the course proposed to be taken by the Gas Committee would mean an increase of 3½d. in the pound, when considered in conjunction with the decision of the Electricity Committee to take £3000 a year for three years out of the revenue. He wished the members of the Council to realize this, and not blame the Finance Committee when the time came for levying the rates. He moved that the matter be referred back; and Mr. Spencer seconded the amendment. Mr. J. Collinson, the Chairman of the Gas Committee, explained that his Committee were endeavouring to conduct the gas-works on the basis of sound finance. If trading concerns had always to wait for an opportune time to write down their plant, the opportunity might never come. The minutes of the Gas Committee were confirmed.

King's Norton and the Testing of Birmingham Gas.

When presenting to the Birmingham City Council the report of the Gas Committee with regard to the Bill of the King's Norton and Northfield Urban District Council, as noticed in the "JOURNAL" a fortnight ago (p. 294), Alderman Sir Hallewell Rogers moved that the City Council should petition Parliament against the measure—which, it may be remarked, is to authorize King's Norton to place within their district testing-stations and apparatus for testing the gas supplied by the City Council. He said that when Birmingham acquired the gas undertaking in 1875, they specified in the Bill that the gas should have an illuminating power of 14 candles at the works; but the petitioners against it urged that the test should be applied at places distant from the works. Parliament decided that the testing-place should be at the works, but that the standard should be 15-candle power. During 31 years, the Corporation had carried out this obligation; but for some unexplained reason, the King's Norton Council, in whose district less than 10 per cent. of the gas was consumed, desired to impose on the Corporation an obligation which did not touch them under the existing statute. They had practically received no complaints from consumers in the King's Norton district during the last five years. Mr. Titterton, in seconding the resolution (which was carried), said that, as a resident in the King's Norton district, he was satisfied with the quality of the gas supplied by Birmingham.

At last week's meeting of the Barrow Town Council, the Gas Committee recorded the purchase of land at Salthouse for a proposed new gasholder. Alderman Barrow, in opposition to the scheme, expressed himself in favour of telescoping the present holders, which he said should be done at half the cost, while improving the pressure all over the town. The proposal was referred back to the Committee.

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At the meeting of the Company to-morrow week, the Directors will report a profit of £102,041 for the past year. Adding the balance brought forward, £17,537, there is for distribution a total of £119,578, which the Directors recommend to be appropriated as follows: Interest on debenture stocks, loans, &c., £18,999; intermediate dividends (less income-tax), £40,810; final dividends (at £4 and £4 12s. 6d. per cent. per annum, less income-tax), £41,570—leaving a balance of £18,198 to be carried forward. The quantity of gas sold during the past year was 2,960,424,000 cubic feet—an increase of 72,620,000 cubic feet, or 2·51 per cent., upon the sales in the previous year. The revenue from the sale of gas was £255,695, against £247,669; and from residuals £95,635, against £96,126. The coke market, which was weak in the first half of the year, gradually improved, and is at present in a strong position. The Company supply gas to 91,989 consumers—the number having been increased during the year by 9535 prepayment and 920 ordinary consumers. There are 53,015 cooking-stoves out on hire; being an increase of 9234 prepayment and 525 ordinary.

Wolstanton Gas Scheme.

A lengthy discussion took place at the last monthly meeting of the Wolstanton Urban District Council with reference to a resolution which had been agreed to at a special meeting held previously; but nothing was done to upset the decision already come to. At the special meeting—the business of which was taken in committee—the Clerk (Mr. E. Hollingshead) read a letter from Messrs. Corbet Woodall and Son, forwarding plans of the proposed new gas-works, prepared in accordance with the instructions of the Council. The plans were laid before the meeting, and explained by Mr. Woodall. Detailed information as to the cost and capacity of the works, and the cost of production and distribution of gas, were given; and figures were also produced by Mr. Woodall showing what the position would be if the Council purchased gas in bulk. The alternative proposals were considered at great length; and after the rejection of a resolution to the effect that tenders for the supply of gas in bulk for five years should be obtained from the British Gaslight Company and the Burslem and Newcastle Corporations, the following motion was declared carried: "That the plans for the erection of a new gas-works at Chesterton, prepared by Messrs. Corbet Woodall and Son, be approved and adopted, and Messrs. Woodall instructed to proceed with the specifications and obtain tenders for the necessary work, to be brought before the Council."

The Trouble with Inverted Gas-Globes.

In the current number of the "Ironmonger," there is the following letter on this subject by an engineer: "Some weeks ago you published numerous letters and an article relating to the failure of the globes belonging to inverted incandescent gas-burners, in which the blame for the breakage of the globes was largely ascribed to the burners themselves. The experience I have had during the last few weeks, however, tends to show that the blame may often attach itself to the glass, or to the makers thereof, rather than to the burners. About three years ago, I put up an inverted burner in my kitchen; selecting for it a particular globe which appealed to me because it was colourless and practically devoid of ornamentation. That particular globe has remained in regular service to the present day. At the beginning of this winter, I erected two inverted burners elsewhere, and, in consequence of my experience, chose for them globes of the same pattern, and, presumably, make. One of these globes lasted about fourteen evenings, the second about four, and the third about three; and they all broke with loud reports from the bottom upwards, showing that they had not been nipped. An inspection of the last two showed that the cracks gaped before the pieces fell apart; and therefore it was evident that the glass of these newer globes, unlike that of the first specimen, was originally in a state of strain, having presumably been insufficiently annealed. I may add that all the fractures occurred on the one burner—a Kern—the mantle of which was in perfect condition."

The Price of Gas in New York.

Our readers are aware that litigation is pending between the Consolidated Gas Company of New York and some of the consumers, on the question of the price to be charged for gas. The matter was referred to at the recent annual meeting of the Company, when the reports submitted by the Treasurer, covering the period ended the 31st of December last, showed that the sum of $1,994,417 had been deposited, pending the final decision of the Courts. It is explained that this deposit represents the difference between the amount collected by the Company at the $1 per 1000 cubic feet rate and what the sum would have been had the rate collected been 80 c., as provided for by the Act of the State Legislature. The deposits have been made under a ruling in the United States Circuit Court permitting the Company to charge the old rate upon paying into Court the price charged in excess of 80 c. As this order was effective from May 1 last, it is shown that during the eight months remaining in 1906 and covering the period during which the above-named deposit was made, the Company did a gross business in gas amounting to $9,972,085. This is at the rate of $14,958,120 per annum, which indicates that, providing the Company are eventually forced to furnish gas at the 80 c. rate, the annual loss, under the present consumption, would be $2,991,624, or 3·74 per cent. on the $80,000,000 capital stock. The claims of the Company against the city for $2,884,789 for gas lighting and $2,613,821 for electric lighting are based on the terms of certain contracts entered into by the Company and officials of former administrations, over which there have been disputes resulting in the Company taking the matter to the Courts, where it has not been disposed of. Providing the Company win their case against the city, the amount to be collected, totalling $5,498,610, will be equal to 6·87 per cent. on the capital stock.

There was recently on view at an agricultural show in Berlin what is believed to be the first self-contained portable gas-engine and suction gas-producer plant. The whole of the parts were on one frame, which could be fixed on foundations or mounted on four wheels for transit.

RADIATOR PICTURES, No. 16.



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Incandescent Gas Lighting at Canterbury.—The Canterbury City Council have accepted the offer of the Gas and Water Company to convert and maintain the existing gas-lamps on the incandescent system, free of expense to the Corporation, at the existing contract charge of £4 per lamp; the gas contract to be in force for three years. It is, however, understood that the Council have the power to discontinue at will the use of any of the existing lamps.

Newquay Council and the Water Bill.—It was decided by the Newquay Urban District Council last Tuesday to oppose the Bill which is being promoted by the Newquay and District Water Company. The Council had asked for certain concessions and modifications of the Bill, and two letters had been received in reply; but it was stated that in these the Company did not deal definitely with the Council's request. It is understood that if the Company are prepared to meet the Council, the opposition will not be continued.

Reduction in Price at Reading.—The Directors of the Reading Gas Company have decided to reduce the price of gas to ordinary consumers by 2d. per 1000 cubic feet as from Dec. 31 last, and to increase the quantity supplied to users of prepayment meters from 23 to 25 cubic feet for 1d. The change as regards the prepayment meters will be commenced during the current quarter. Within the past 3½ years, the price of gas has been reduced from 3s. to 2s. 7d. per 1000 cubic feet in the case of ordinary consumers (no meter-rent being charged); and the quantity given through prepayment meters has been increased from 21 to 25 cubic feet for 1d.

Management of Llandudno Gas-Works.—The Llandudno Urban District Council have held a special meeting to decide upon the terms of appointment of the Gas Manager who may be chosen to succeed Mr. Thomas Davies, whose resignation was noticed in the "JOURNAL" for Jan. 8. A resolution was passed unanimously accepting the draft terms and list of duties submitted by the Gas Committee. According to these, the salary will be £145 to commence with, rising to £175, and a house rent free. Hitherto the Manager has been under the control of the Engineer to the Council, and has had to do with the manufacture of gas only; but in future he is to be under the control of the Gas Committee, and, in addition to being entirely responsible for the manufacture of gas, is to have charge of the meters, cookers, &c.

Abergavenny Corporation's Dispute with their Gas Manager.—Last October it was reported in the "JOURNAL" that, as a result of Mr. Hubert Russell refusing to place his immediate resignation of the position of Manager of the Abergavenny Gas-Works in the hands of the Gas Committee, it was decided to pay him a month's salary and terminate his appointment forthwith. This Mr. Russell refused to accept; and he commenced an action (which was down for hearing at the Monmouth Assizes this month) against the Corporation to recover damages for wrongful dismissal. After lengthy negotiations, however, Mr. Russell's Solicitor has notified his client's willingness—in order to end the matter—to accept £27 12s. 6d. in full settlement of any claim made against the Corporation. This is, it is pointed out, practically what the Corporation offered originally—the amount of salary then due to Mr. Russell, and one month's salary as an act of grace.

New Joint-Stock Companies.—The Combined Incandescent Mantles Syndicate is the title of an undertaking formed with a capital of £33,000, in £1 shares (3000 preference), to acquire the benefit of an option for the purchase of inventions relating to the manufacture of incandescent gas-mantles, with certain patent rights and other property, conferred by an agreement made between J. P. H. Soper and C. V. Houssart. There will be no initial public issue. The Wellington Tube-Works, Limited, is the title of a Company formed with a capital of £20,000, in £1 shares, to acquire the works and premises at Great Bridge, Staffordshire, known as the Wellington Tube Works, with certain plant and machinery; to adopt an agreement with A. J. Ash; and to carry on the business of tube makers, ironmasters, manufacturers of galvanized and corrugated iron and steel, &c. There will be no initial public issue. The first Directors are Messrs. A. J. Ash (Permanent Director and Chairman), Kenneth Aird, and W. H. Turner.

The Hoddesdon Gas Company have placed an order with Messrs. Biggs, Wall, and Co., for one of their new pattern rectangular sulphate of ammonia stills and heater, capable of producing one ton of sulphate per day.

What is described as the most destructive explosion in the history of Woolwich took place yesterday morning in the Chemical Research Department of the Arsenal; but though it caused much damage to property, it was fortunately unattended by loss of life. One effect, however, was to throw one of the gasholders out of position, and allow the gas to escape.

The Montrose Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a retort-bench, on Waddell's patent shallow regenerator system, complete with foundations, retort mountings, and with Scott and Dempster's patent travelling platforms in lieu of the usual floor-plate covering. These platforms are used at Galashiels, East Dereham, Lockerbie, Portadown.

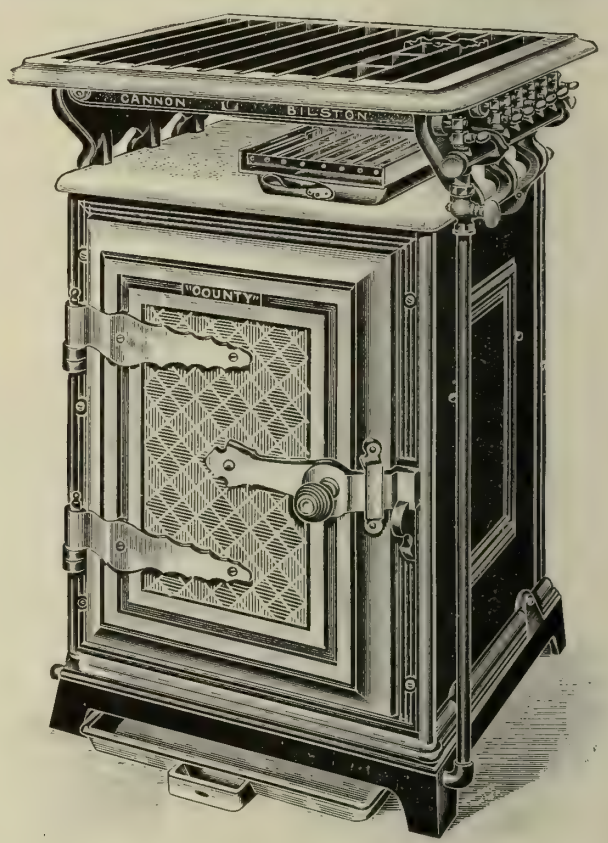
We have received from Messrs. D. Hulett and Co., Limited, their new catalogue of gas-lamps for street and shop lighting, incandescent arc lamps and burners, lamp-columns, brackets, force-pumps, service-cleaners, &c. The bulk of the catalogue is devoted to lamps; and the samples shown include the "Humphrey," the "Lucas," the "Sydney," and others, in endless variety. An index facilitates reference to the contents. The catalogue is stitched in an artistic cover.

A young man named Charles Scott, living at Leeds (who was wanted by the police on suspicion of robbery), committed suicide by placing in his mouth one end of a tube the other end of which was attached to a gas-bracket. He tied a muffler round his nostrils and mouth, and made a hole in it to allow the tube to pass through. The tube was secured by a piece of string tied round his neck. The Coroner remarked to the Jury that a more deliberate act of self-destruction had perhaps never come before them.

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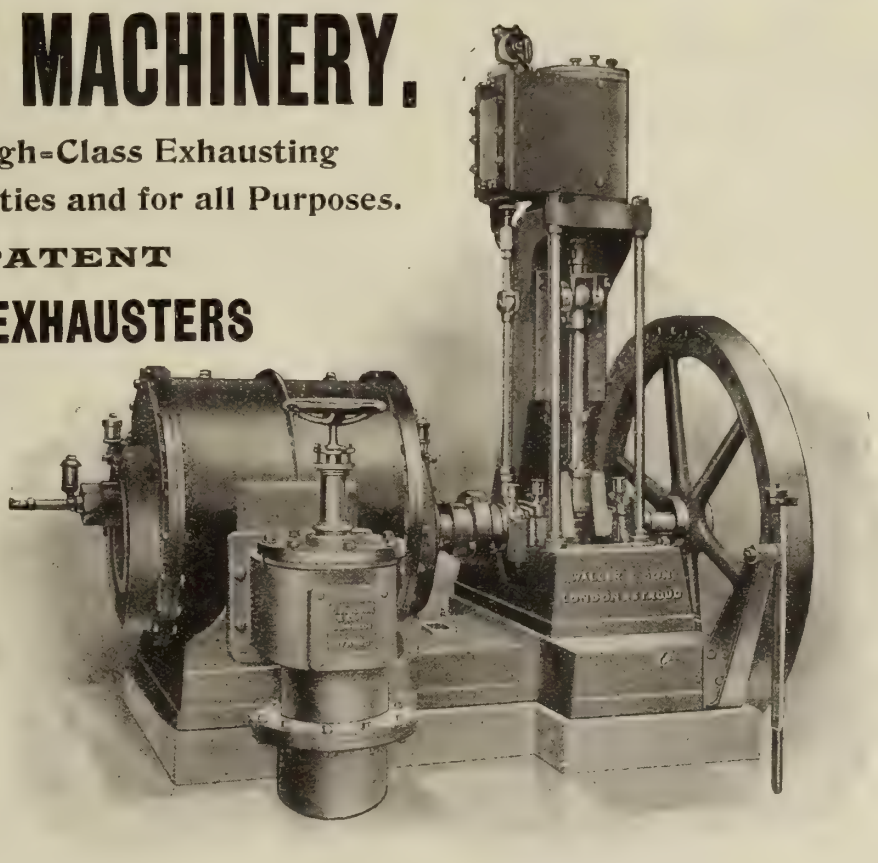
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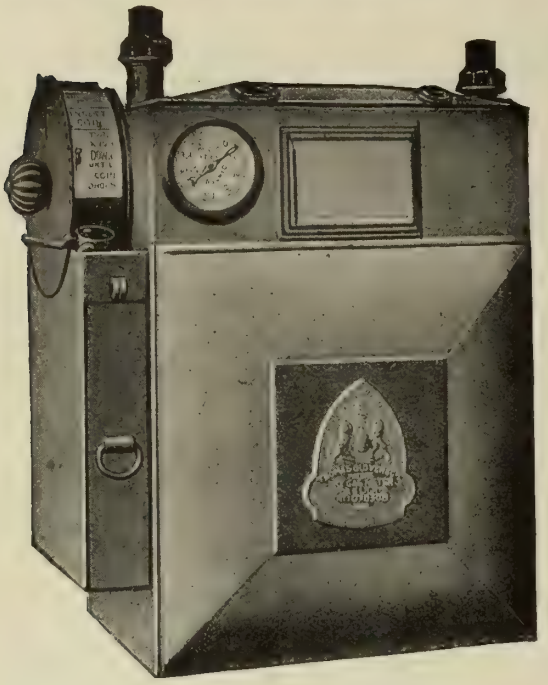
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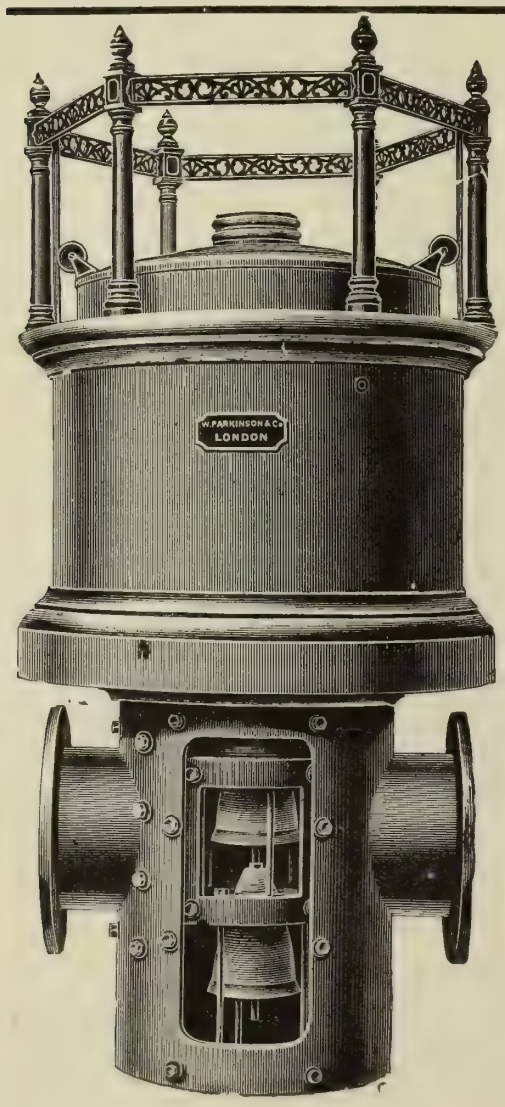
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EDITORIAL NOTES—GAS, &c.

The New Session—Petitions against Bills.

UNDER clouds, political and atmospheric, the second session of the present Parliament was opened last Tuesday. The King's Speech does not foreshadow a programme of public legislation of any importance to industry. Labour monopolized so much consideration in the first session, that it is insinuated by the polite method of silence that little of the time of Parliament will be occupied by labour questions this year, if the Government are masters of the situation. This, of course, has not given pleasure to the Labour and Socialistic party in the House; and already there are protests against this and that—Old Age Pensions, for example—being ignored in the speech from the Throne as subjects that should be brought under immediate discussion. But if there is one thing that it is safe to say about the present session, it is that the Labour and Socialistic party will not fail to obtrude themselves and their desires both in and out of season. Already there are complaints from trades unions that their representatives have shown a wonderful and unacceptable aptitude for shaping their own policy; and it is thought that those who "pay the piper" should be privileged "to call the tune." Personal comfort will not be served by the labour representatives in Parliament quarrelling with those who recompense them; for any serious breach would mean for the recalcitrants a rapid descent from the benches of St. Stephen's to the workshop bench or to the re-handling of pick and shovel. Therefore, as we say, they are bound to make themselves seen and heard; and there are portents that because there are not sops for Cerberus, he will make himself disagreeable with the Government, instead of being content for a time with the large concessions that were obtained on first asking.

But to go to the other end of the Legislature. Between the House of Lords and the Commons what are described in the King's Speech as "unfortunate differences" have arisen; and Ministers have the matter under consideration with a view to some solution of the difficulty. The "difficulty" is the exercise by the Lords of their right of acceptance, revision, or rejection of measures sent up from the Commons. The right is possessed equally by the Commons in respect of measures sent down to them from the Lords. But the Commons are not agreeable to the Lords overhauling their work. There has been some fatuous talk about the abolition of the Upper House by those whose shout is stronger than their knowledge. The House of Lords being an integral part of the Constitution cannot be squeezed out of it on the peremptory demand of those to whom offence has been given. It is therefore merely the question of the "relations" of the two Houses that the Government can raise; and it is to the mending, after their own fashion, of those relations that the Government are about to devote themselves. In connection with gas legislation, the advantage of the Upper Chamber has been frequently felt, and at times also the disadvantage. But, on the whole, advantage has outweighed disadvantage; and with the accelerated mobility of Socialism, the need for the House will be all the greater in the future.

Among the foreshadowings of public measures, it is noticed that the regulation of the hours of labour in mines is to be considered; and the question of the amendment of the patent laws—principally to compel the working in England of foreign patents registered in this country—is to be introduced by the President of the Board of Trade. The "improving" of the law relating to the valuation of property will also have place among the polemics of the session. Bills of private members have come up with appalling force; but those that have gained the first dozen places, and are the only ones likely to be dignified by consideration this session, comprehend Bills relating to railway and canal rates and conditions of conveyance, the compulsory use of the metric system of weights and measures, the eight-hour miners' day, and the London Ports and Docks Bill. Against the last-named measure, there has been heavy petitioning; the London and other Gas Companies having works on the Thames being among those whose interests will be affected, and who intend to do their best in defending them.

The last day for lodging petitions against privately deposited measures having expired on the 12th inst., we are able to give elsewhere in this issue a list of petitioners against Gas Bills, supplemented by the names of Bills against which gas undertakings are compelled to protest, in order to obtain protecting clauses, or to assist in efforts to secure rejection. Wisdom has prevailed among those local authorities who have had introduced to their notice the second Joint Bill, promoted under the wing of the Gas Companies' Protection Association, for the removal of clauses relating to sulphur compounds in gas. There has not been a single petition lodged; so that the measure will proceed unopposed through the first House. Several of the local authorities have, and very properly (they being laymen in these matters), sought expert advice; and, in those instances that have come to our notice, the sound counsel has been given that—the question having been thoroughly thrashed out by competent men and before Parliament—it would be the height of absurdity to continue to attack a question settled beyond further dispute. Of the fifteen other Gas Companies' Bills introduced, a dozen of them have had petitions presented in opposition; but this is no indication as to the amount of contest that will ensue. In several cases, the petition is a mere precautionary measure, so that the authority may not be "out of court" in the event of negotiations failing; and the next few weeks will, if the history of recent sessions repeats itself, see much of the difference composed. The London County Council are not, through lack of opportunity more than of inclination, very busy among the Gas Bills this session; there being only one—the Mitcham and Wimbledon—in which they have managed to find something against which they desire, and apparently have, the privilege of protesting. The Llandrindod Wells Gas Bill will be an interesting measure, in that it reverses the usual conditions. Hitherto, it has been the experience of gas undertakings to have electric lighting undertakings invading their territory. Here the tables are to be turned; and, if Parliament endorses the Bill, a gas undertaking is going to invade the territory of an electricity undertaking. Llandrindod Wells has never enjoyed the conveniences of a gas supply; and, in fact, many of the inhabitants are not fully aware of the achievements in improved utilization of gas. It is consequently believed by the promoters of the gas undertaking that there is a good field in the town for profitable enterprise. The Local Authority have obtained clauses in their favour which they have honourably agreed removes all ground for opposition to the new scheme. The only petitioners against the measure are the electricity suppliers; and it is an indication of their feelings in regard to the threatened competition of gas that they have offered the Council their concern at cost price, *plus* 6 per cent. The judicious decision of the Council is that it is better they should not take any steps in the matter—at present. The East Hull Gas Company are, naturally, petitioners against the compulsory purchase Bill of the Corporation.

A sign of the necessity for presenting a compact front to the growing socialistic tendency of the times is furnished by the position of things electrical in London. The electricity scheme of the London County Council is, as we have shown, one having for its ultimate object the concentration of practically the entire electricity supply of London in their hands—an attack on existing interests encouraged to the utmost by the present Government. Through it, the Electricity Companies have at length been forced to propose

to amalgamate their systems as one way of resisting this deliberate assault on their pioneer enterprise. Defence has been for them a costly matter in recent sessions; and before the end much more money will have to be spent. What the Companies are prepared to show Parliament is (according to Colonel Eustace J. A. Balfour) that, if the power is given them to combine, they will be able to supply electricity in London at as cheap a rate as that offered by the County Council without any risking of public funds. And this is to be the result of the combination and better organization of existing resources. The Gas Companies are going to take a hand in the opposition to the County Council and certain other electricity schemes. It is perfectly obvious that London electricity supply will be the central feature of Private Bill work this session; but upon it the issue of the County Council elections next month will make a big impression, no matter what that issue may be. Of more immediate concern will be one or two fairly tough struggles in connection with Gas Bills. Beyond them, we are not anticipating there will be much argumentative work to be done, other than in private negotiation.

South Metropolitan Meeting—Coal Contract Prices.

From the plethora of topic before him when addressing the proprietors of the South Metropolitan Gas Company last Wednesday, Sir George Livesey had no difficulty in making an excellent selection; and the treatment of the subject-matter did not grant place to a dull moment throughout the speech. It was a speech that, from beginning to end, indicated a distinct disbelief in the tenets of the passive resister. Defence and active resistance animated almost every sentence. Right at the outset Sir George douched the operators in the Stock Market with some penetrating facts, which show how superficial was their observation when they thought fit to write-down, by a point, the price of the Company's stock, on the ground that the Directors' report for the past half year was "unsatisfactory." It was not the writing-down of the stock by a point, but the cause, that gave offence. A fortnight ago, in dealing with the Company's report and accounts in the editorial columns, clear indication was made that, the circumstances of the half year considered, the results were not such as need create any dissatisfaction. There have been slight depressions in the financial level of working since the price of gas has been at 2s. per 1000 cubic feet; but those depressions have been comparatively slight, and are entirely traceable to causes that could not possibly have been foreseen or controlled by any group of administrators, however gifted or capable—causes such as the capriciousness of markets and abnormal meteorological conditions. When there is talk of the half year's report being "unsatisfactory," it indicates that intelligence is unequal to going, or indisposed to go, lower than the surface of things. In this case, if there had been penetration instead of contentedness with the superficial aspect, dormant resources would have been discovered, which are immediately available if those that are current should show any disquieting deficiency.

There is one dormant resource in the South Metropolitan Gas Company that the Chairman and his colleagues are loath to disturb if they can possibly avoid it, and that is the price of gas. It has been proclaimed from the chairs of the three London Gas Companies—and with no uncertain note from that of the South Metropolitan, notwithstanding external gratuitous counsel—that the price of gas will only be raised if the circumstances which have not yet been fully sounded, make such a course imperative. No one, with nebulous conditions present, would be so foolish as to say that an increase in price will not be requisite; but it is hoped there will be a means of escape from recourse to such action. Anyway, it will only be a "serious" advance in the price of coal that will move the Directors of the South Metropolitan Gas Company. A 1d. increase in the price of the gas would immediately add income at the rate of £52,000 a year. No question of diminishing the Company's existing dividend by the operation of the sliding-scale comes into consideration in the determination of the Board not at present to supplement revenue by that amount, seeing that the 5½ per cent. dividend is now below the statutory point with gas at 2s. The Company could, in fact, raise the price by 2d., and bolster their income up with £104,000, without doing any more injury to the proprietors than reducing existing dividends under the sliding-scale by 8d. per cent. That is the most important of the dormant resources. If, however, it is not the comparatively small financial deficiency in the earnings necessary to pay the now customary, though not quite statutory, dividend, that caused the market to regard the report as "unsatisfactory," then it must have been the slight recession of the consumption of gas in this half year of abnormal heat and light, aided by the economy of the incandescent burner, which does not encourage waste in any way; for waste with it fortunately means loss of illuminating power. The change that set in towards the close of the half year, when the thermometer fell rapidly, caused a spurt in consumption; but, owing to the early reading of the meter indices in a large part of the district, neither that nor the Christmas consumption lent any material assistance to the half year. Its influence, however, will be felt in the current six months. It seems a little unfair to the December half of the year that, commencing in the summer, it should not get the credit of a larger proportion of the heaviest days' consumption; for as things are, the June half year gets the largest pull from the season of fattest consumption. On a yearly comparison, the inequalities are ironed out.

Candid, pointed, and spirited were the remarks that Sir George made on the increase in the quoted prices of gas coal. This question of coal prices with the approach of the contract season is for the gas industry no mere sentimental one; it is a question of business, and must (though the coal owners would have it otherwise) be dealt with in a business-like way. The coal owners, through their representatives, are accusing Sir George of crying out before he is hurt; but a little reflection will show that this is one of those matters in which there is precious little good in crying out after the hurt has been inflicted. When the threat is uttered, then is the time for protest; for the absence of protest may be taken to imply that the execution of the threat will be taken quite good-humouredly. Because the gas industry is not submitting tamely to their inflated demands, the coal owners are feeling aggrieved. They plead that the present is a well deserved boom, which will enable them to make up past losses; and they deny the existence of any combinations or understandings among themselves. They suggest that the gas industry should dream while they are active; and they decline to recognize that there is an obligation on the part of Directors and Committees to do everything possible to purchase cheaply, even to meeting united action by the like. Their one-sided views do not command approbation. The gas industry quite admit that the time is one when a higher price should be paid for coal; but the rapacity that has come with opportunity is the ground of complaint. It is idle for the coal owners to try to justify the prices they are quoting for future contracts, by talking so loudly about past losses. The prices of gas coal continued too long in the nineties with only variations within a shilling for credence being now given to the attempted vindication of the owners' flights in the present by holding up their business in those years cloaked in a kind of commercial philanthropy, with trimmings of self-denial. There is no disputing the fact that coal owners' expenses have increased; but between the prices of a few years ago—with now a fair additional profit in view of the increased prosperity in the iron and steel and textile industries, including, too, the extra working costs—and the prices upon which the owners have set their minds there is a margin for the existence of which there is no justification.

As to the assertions that it is a mistake to suppose there are combinations among the coal owners to maintain prices, they can upon the evidence only be treated with suspicion—we might almost say with contempt. The assertions emanate from owners' Associations; and the "Iron and Coal Trades "Review," the official organ of the National Association of Colliery Managers, says: "At the present time, gas under-"takings are face to face with a large rise in the price of gas "coals; and what is equally important the coal owners are, "by reason of local associations of collieries, producing gas "coals under excellent circumstances for taking advantage "of the situation." In face of this, how can the gas industry regard as reputable the denial of combination? The owners will hardly thank the official organ of the Managers' Association for its frankness. At both the South Metropolitan and Commercial Gas Companies' meetings, the effect that the removal of the coal tax is having on the industry of this country was emphasized; and the present exaggerated views of the coal owners as to home prices will do more than anything else to spread, and give prominence to, the question as to whether the abrogation of that tax was wise in the interests of the country. It is for the coal owners

to look at this matter broadly, and ask themselves whether their present abuse of opportunity will not be more detrimental to them in the long-run than moderation. There is one crumb of satisfaction. The current half year is not the one, owing to current contracts, that, with most gas undertakings, will feel to the full the effect of the high-priced coal; but it will not be forgotten that the fresh increases in quotation are additions to the increase of last year. In Sir George Livesey's speech, there are many points bearing upon this subject that are worthy of more than passing consideration.

Commercial Gas Company.

As we anticipated, the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw) had, at the meeting on Thursday last, little more to tell the proprietors than the accounts revealed. Buoyant spirit and sanguine temperament, combined with prudent care, are useful aids when difficulties impend; and no proprietor could have left the meeting without being impressed that these important factors in successful business administration are concentrated, in no mean degree, in their Chairman. He gave due weight to the anxieties and difficulties that the Board had in front of them, especially in connection with coal; but he declared that those "anxieties and difficulties were not insuperable if "they brought care and determination to bear upon them—"certainly, they were not intolerable when they had the "support and sympathy of the proprietors." He places great reliance, too, on the loyalty of the workmen in helping the officers and the Board to pull through the difficulty, by producing better work and realizing increased economy. The Company—through the reconstructions of recent years—have their works and means of material conveyance to and from the works in excellent order to assist in producing the maximum economy. No considerable capital expenditure is in view other than for the requirements of the business in the district; and there is no abatement in this, nor is any required, for the capital so expended becomes, through additional consumption, immediately remunerative. Notwithstanding the pressing claims that the Company have had upon them for capital in this direction, and notwithstanding too that under their old Act (which gave the proprietors the advantage of new issues at par) they were working with extraordinarily dear capital, it is interesting to note the moderate condition of the capital expended per million cubic feet. The capital on works and mains stood at the close of last year at £374 per million cubic feet; and, including prepayment meters, services, steamships, &c., the total capital only averaged £442 per million. For this state of things the Chairman gave honour where honour is due. Mr. Bradshaw also addressed himself to the prospective increase in the price of coal. When he says that "asking does not "always mean getting," there is the indication that the Board have made up their minds not to take the demands of the coal owners lying down. At any rate, two-thirds of the coal that will be used by the Company in the present half year will be at the old prices; so that, it may be anticipated, dearer coal will not have such a material influence this half year that the next accounts will be greatly affected. Mr. Bradshaw has announced the intention of the Directors to strain every nerve to avoid the necessity of raising the price of gas; and, knowing the views of certain members of the Board as to low prices to consumers, that intention is precisely what would be expected of them.

Electricians and Gas Fatalities and Explosions.

The Electrical Press, or a section of it, are just now taking either a morbid interest in gas fatalities, or their extremity is so pressing for argument to turn householders from their preference for gas to electricity that they have to rake among the effects of negligence and suicide to help them. We should not raise any serious objection to this, if, in using the results of these lamentable occurrences, our contemporaries would fairly and honourably explain the means by which the gas escaped that brought about the fatality, so as to show householders that folly and not gas was the primary cause. Negligence and premeditated self-destruction are responsible for the greater number of these happenings that are reported by the Daily and Electrical Press as "gas fatalities." Neglect of the old-time chandelier is a somewhat fruitful cause of escaping gas; and gas suppliers are constantly urging their abolition by consumers, as we have also done on several recent occasions—the last time in an editorial being in the "Journal" for Aug. 14. Water-slide chandeliers have altogether lost their market; and they are not suitable to present-day lighting. Those that are in existence are relics of the past; and in modern equipped houses they are not to be found. Their fewness causes people, where they are retained, to forget the necessity for replenishing periodically the water-seal, and the negligence in performing the simple duty has a bad way of extending itself. It is therefore better, as gas suppliers are constantly suggesting, that those remaining should be "scrapped." Moreover, the water-slide chandelier is, unless coverted into a fixture, totally unsuited for modern gas-lighting equipment. In the olden days of flat-flame burners and globes, the water-slide chandelier had less weight to carry than it has when fitted in modern style. We have seen a lightly built chandelier fitted with adapters and three inverted burners and globes. The weight this chandelier had to carry was considerably increased, with the result that the line of water-seal was also considerably reduced, and more frequent watering was consequently required. Much the same with vertical incandescent burners, with chimneys and heavy globes. One chandelier so fitted (with counterbalance weights unequal to the increased pull) that has come under observation, had the chains wired to the pulley-wheels to prevent descent. These illustrations by the way, merely to show the unsuitability of water-slide chandeliers for modern fittings.

It is, however, the personal part that householders, by negligence, take in producing disaster that the electricians, when referring to fatalities and explosions, glide over in a manner that can only be described as dishonourable, with a view to defaming their strong competitor. On the points of cost and illuminating power, they have utterly failed in impressing the average householder. The facts have been too stubborn. The householder, too, whose father, grandfather, and perhaps great-grandfather lived in rooms lighted by gas, listens with amusement, and treats with contempt, the tales about the poisoning of the atmosphere—particularly now that the incandescent burner has so considerably curtailed the amount of gas used in rooms. Under these circumstances, the electricians are trying to coerce the gas consumer into a change of patronage by endeavouring to excite terror, with illustration of the effects of negligence or carelessness, and by laying the blame upon gas when it is entirely a personal matter. If people will have loose gas taps, neglect to replenish the water in old-fashioned chandeliers, will retire to rest with pipes that they have plugged with cork and soap instead of having them properly capped by a competent fitter, or if they will make, or allow to be made, connections between two pipes (as in the Whitechapel case) by a piece of india-rubber tubing, the fault lies not with gas but with themselves. Just as fairly could it be said that cycling should be condemned because foolish riders chose to go down hills on machines with unworkable brakes, loose nuts, or cracked frames or rims, or that razors should be vilified because some folks chose to employ them instead of some other method open to them for terminating their earthly career. The "Electrical Times" and the "Electrical Bulletins" have been quoting cases of gas fatalities without in all cases explaining how they have been caused; and they give a little list of fatalities which shows by comparison with the 5½ millions of gas consumers in this country, without counting families and employees, what a safe thing gas really is, and how free from fatality the gas industry would be if it were not for consumers' personal negligence, intentional act, or the disturbance of gas distribution systems and the soil about gas-pipes by the unavoidable (though not always carefully conducted) road work of local authorities and companies in connection with other services—electricity, for example.

The adjectives that are used by those of our electrical contemporaries who deal with this subject are chosen with discrimination, with the view of striking terror deeply into the minds of gas consumers; but in certain cases the object is spoilt by intermingling a flippant style, which indicates a shallow earnestness. Flippancy has neither weight nor durability, but the dismembering of the statements of opponents for the purpose of making a point, may have weight and durability through the disguising, thus meanly produced, of the intention of the original words. The "Electrical Times" says: "It is admitted by the 'Journal of Gas Lighting' "that in many gas-works in the country electric lighting is "the vogue on the score of safety." Was it fair of our contemporary to leave out the appended words—viz., "in those

"buildings where, accidentally, explosive mixtures may be "formed?" We do not feel in the slightest degree injured; but it is apparent there is room for a little more honour even in journalism. In the very same issue in which the "Electrical Times" belittles itself by this abbreviation of a quotation to obtain misrepresentation, there also appear certain illustrations of some wrecked rooms said to have been due to a coal gas explosion. The rooms are lighted by electricity; and our contemporary remarks that this is a case where gas escaped from the fittings probably as the result of a faulty connection in the neighbourhood of a ceiling rosette. If this is so, it might be well to inquire who disconnected the old gas-fittings, and capped the pipes in the rooms where electricity is used; for gas-pipes being in existence it may be presumed gas was previously employed. It may be found that it was through this disconnection and imperfect workmanship, that the escape was caused; or perhaps it is an instance of the fusion of a gas-pipe through the companionship of a defective electric wire. Perhaps the electrical fitters can throw some light on the point. No information in this regard is given in our contemporary; and so we make the suggestions as ones that it may be found worth while looking into. We are also reproached with giving the minimum of space to the reporting of gas explosions and fatalities. Unfortunately for the "Electrical Times," the illustration of our shortcoming in this respect to which they gave the prominence of reproduction, was the subject of a further paragraph in the succeeding week's issue of the "JOURNAL." This was not acknowledged by our contemporary. Looking back, we do not remember that the electricity papers devote to fires, fatalities, and other accidents in which electricity is concerned, quite so much space as we do to similar occurrences in connection with gas.

However, as electricians are persuaded that it is hard to gain business by merit, and so have in their desperation to seek the aid of fatalities brought about in most cases by allowing gas to leak, carelessly or intentionally, we merely ask them to make use of that aid in an honest manner.

National Physical Laboratory.

ATTENTION was directed in the "JOURNAL" in November, 1905 [Vol. XCII., p. 528], to the fact that the National Physical Laboratory had not up to that time applied to good purpose the State grant and other funds placed at its service. It was pointed out that very little physical research work had been accomplished, and that there were grave reasons for suspecting that the objects for which the Institution was founded were being neglected in favour of commercial projects for which it was not adapted, and with which it had no proper concern. Our attitude towards this comparatively young national institution may at the time have seemed somewhat ungenerous; but it has been fully justified by the course of subsequent events. Before the ensuing summer questions had been asked in Parliament with reference to the work undertaken and accomplished at the Laboratory; and an admission had been reluctantly drawn from the Government that much of the work lay outside the sphere of activity defined for the Institution at its inception. The misuse which the Laboratory had been making of its position and support as a State institution was so clearly displayed that the demand for inquiry into its operations could not be indefinitely disregarded; and we recorded last week the appointment by the Treasury of a Committee "to inquire generally into the work now per-"formed at the National Physical Laboratory, with special "reference to the character of the tests undertaken there "and the lines on which any further development of the "work of the laboratory should proceed."

"The Times," in its Engineering Supplement, and several of our technical contemporaries have already complained of the composition of this Committee on the ground that the Chairman, the Right Hon. G. W. Balfour, is a near relative of the Chairman of the Executive Committee of the laboratory, and that two other members—viz., Sir Andrew Noble and Sir J. Wolfe-Barry—are members of the Executive Committee, and are declared advocates of the laboratory's policy of commercial aggrandisement which has hitherto given such offence. No impartial judgment of the things done and the equally important things left undone by the laboratory in the past can be expected of a Committee of which a majority is virtually pledged at the outset to a particular view. It would be nothing short of a national scandal if the inquiry into the work of the laboratory were left in the hands of a biassed Committee; and some change in the composition is therefore peremptorily called for. The addition to the Treasury Committee of a number of technical men who are entirely independent of the Executive of the laboratory is suggested by "The Times," and might suffice. But it would be far better for the Treasury to entirely re-constitute the Committee of Inquiry.

It should not be forgotten that serious as is the charge that the laboratory is illegitimately interfering with the private work of engineers and others who undertake, satisfactorily, trials of plant and processes, and routine mechanical testings, the still more serious accusation is made against it that its legitimate work of research and standardization is being neglected and badly performed. That this accusation is not without good foundation must be obvious to gas engineers who have followed our reports on the photometrical investigations which the laboratory appears to have undertaken light-heartedly and to have carried out under improper conditions in the intervals between ineffectual attempts at the verification of secondary standards of light. As a fact, important investigations—such as that recently reported by Mr. Paterson, on the behaviour of standards of light—should never be pursued without outside direction from an Advisory Committee of experts in the particular branch of technics concerned. Otherwise, the investigations will most commonly prove futile owing to the well-meant but misdirected efforts of the laboratory staff. If, for instance, photometrical investigations are to be further pursued at the laboratory, let a few competent experts be asked to advise as to the scheme of research and methods of work to be followed. We do not doubt that the advice of a Committee comprising (say) representatives of the Institution of Gas Engineers, and of the Institution of Electrical Engineers, with one or more of the Gas Referees, and a few independent experts—like Lord Kelvin, Professor Harold B. Dixon and Professor W. E. Ayrton—would have saved Mr. Paterson from the many serious pitfalls into which he fell in the course of his recent investigations on standards of light.

The Gas Section of the Irish International Exhibition.

The time is now fast approaching when the preliminaries connected with the Irish Exhibition will have to be completed. There are, in fact, from the date of this issue of the "JOURNAL," only ten more days before the list of applications must irrevocably be closed for the Gas Section; the exhibition authorities having definitely decided that March 1 is the outside limit of time they can afford. Owing to the want of space the exhibition authorities have been obliged to curtail somewhat the dimensions of the space originally allocated to the Gas Section; and the unoccupied space has now, in consequence, narrowed down considerably. It is therefore hoped that any manufacturing firms who are still wavering in decision will promptly—the earlier the better before March 1—come to a determination, as that will be of great personal assistance to Mr. Francis T. Cotton and to the Exhibition authorities. Those firms who have engaged spaces have, there is no doubt, made up their minds to interest the large public attendance expected, from near and far, during the run of the exhibition; and the members of the Institution of Gas Engineers will, there is certainty, during their annual meeting in Dublin, be equally pleased and interested in making their inspection.

The Flame Standard Tests at Bushey.

Our contemporary the "Electrician" grudgingly admits now that the consideration shown by Mr. C. C. Paterson in referring, in his recent paper, to the courtesy of the Institution of Gas Engineers in permitting him to publish the results of the tests on flame standards which had been made at their request and expense, was in some measure due. The partial concession on the part of our contemporary shows how ungracious and unfounded were their original remarks—viz., "We think it might be held that the permission to publish such results is altogether unnecessary, as they have been obtained by the application of public funds." The matter is not worth bickering over; but it may be pointed out that our contemporary now shifts its ground, in endeavouring to minimize its ignorance of the payment by the Institution of the funds directly spent over the investigation. It is now said

that "the National Physical Laboratory being an Institution which is dependent upon public funds, the results of investigations there carried out should be public property." Just so. But we are afraid our contemporary fails somewhat to see the point of Mr. Paterson's acknowledgment, and of our little protest against their slur upon that acknowledgment. Does it not follow that the tests having been made for the Institution of Gas Engineers and the expenses incurred paid by them, they had certain claims, and their organization was clearly the channel through which publication would, in ordinary circumstances, have been first made. Mr. Paterson in his paper explained that the Institution of Gas Engineers had only refrained from publishing the results earlier at the request of the International Photometric Committee; so that, on the first available opportunity, they would have been published through presentation at a meeting of the Institution. Mr. Paterson desired to use the results before the Institution of Electrical Engineers; and notwithstanding that their own members have not yet received them, the Council of the Institution of Gas Engineers did not demur to, or hesitate in permitting, first use being made of them before the Institution of Electrical Engineers. That is why we consider the remarks of our contemporary were ungracious and totally uncalled-for.

Gas Companies and Capitalization.

In the "JOURNAL" for Jan. 15 (p. 171), there appeared some extracts from an article in the "Joint-Stock Companies' Journal" which showed, by actual example, the great influence that past policy in dealing with the capital expenditure of gas undertakings has upon their present prosperity. The degree of prosperity has, of course, a very close relationship with the capital account; and the price of gas to the consumers relies very largely on the cost of the capital per 1000 cubic feet of gas sold. But with a low capital account, there is another effect, and that is, when reductions of price are made, how largely it widens, under the sliding-scale, the difference between the distribution among the proprietors of the undertakings concerned and the total of the saving to the consumers effected by the reduction. This point was made by Mr. H. E. Jones at the meeting of the Wandsworth and Putney Gas Company last week. In the table published on the 15th ult., it was seen that the charge for capital per 1000 cubic feet in the case of the Wandsworth Company is 6·69d. per 1000 cubic feet; and the ordinary price of gas is 2s. But allowing for discounts, the prices work out to an average of 1s. 10½d. The last reduction that was made to the consumers benefited them to the extent of £3616 in the half year; while, owing to the low capital account, the proprietors have distributed among them only an additional £422 for the half year. That is to say, the reduction in price and the extra amount required for dividend together represent a sum of (using round figures) £4000 in the six months. Of this, the consumers take no less than nine parts out of ten. The one-tenth part that the proprietors receive is not a great reward for the benefits conferred upon the consumers; but the former have the satisfaction of knowing that the position they occupy is one of great stability.

A Suggested Audit Commission.

One of the members of the Liverpool City Council is of opinion that the present audit system is a thoroughly unsatisfactory one—instancing as an example of this the fact that since 1893 some £4000 has been spent on putting up lamps in unadopted streets, an outlay which he contends would not have occurred if there had been a properly constituted audit. To remedy this state of affairs, he proposed at the last meeting of the Council that the present Elective and Lord Mayor's Auditors should be abolished, and in their place there should be "a board of twelve accountants elected by the ratepayers, who would give their services free, and have under them a staff of clerks, and have entire control of the Audit Department." These Commissioners, he argued, would be an intensely critical body, and would, by publishing frequent reports, throw a blaze of light on the doings of every Committee. He confessed that he did not suppose Parliament would give Liverpool a Private Act; but he believed that an expression of opinion by such a body as the City Council would stir up the Government, and induce them to deal with the matter. In the course of the discussion, it transpired that, as long ago as 1896, both the Auditors and the Town Clerk expressed the view that the cost of placing lamps in unadopted streets should be borne by the owners. The Lighting Committee agreed in the first place to the adoption of this course; but at their next meeting the resolution was rescinded, and the Council confirmed the rescission. This, of course, clears away that particular example of the inefficiency of the present system of audit; but several members still persisted in the opinion that a much better arrangement could be made than that now existing. The Corporation, it may be remarked, have already a Control Department, which checks expenditure before money is paid, in addition to the Auditors' Department, which checks accounts after they have been paid; and both these departments are now absolutely distinct and separate. This system, it is stated, has been copied, and is going to be copied, by many other towns. It was pointed out, however, that it is merely an internal audit; and that "a board of directors might as well audit their own accounts, and give themselves a certificate." In the end, the suggestion in favour of an Audit Commission was withdrawn, on behalf of an amendment that the Council should petition Parliament to give effect by early legislation to the recommendations of the Joint Committee on Municipal Trading in favour of the appointment of professional accountants subject to the approval of the Local Government Board.

Municipal Trading Failures in America.

In view of the elections for the London County Council on the 2nd prox., a good deal is being said by the Progressive candidates and their supporters in favour of municipal trading. It may therefore be not out of place to call attention to a few failures which have occurred on the other side of the Atlantic, as recorded by a Nebraska newspaper in the course of a discussion on the refusal of the American League of Municipalities, at their recent meeting in Chicago, to endorse the principle of municipal ownership. According to the paper referred to, the towns and cities in the West were the first to undertake on a large scale the ownership of gas and water works, electric lighting, street cars, railroads, &c.; and it is a noteworthy fact that they have been the first to give them up, and return to competition, where the business man and the skilled engineer can have charge of the public utility systems, to the exclusion of the politician. Among the dozen failures reported from Southern Indiana, that at Muncie is one of the most notable. In that city, the Municipality, who had for years owned the electric lighting plant, abandoned it last summer, and went back to a private contract. May it not be supposed that Woolwich, with its £42,000 of deficiency on the electric lighting account, would be glad to do likewise? Indeed, there are already signs of such a desire on their part, as they are reported to be closing the wiring department shortly. In Denver, the greatest election fight ever known in the State went against municipal ownership, for the simple reason that under this system there had been fastened upon the city "a most pernicious political ring of grafters and saloon politicians, who were kept in power from year to year by their control of the utility company." In order to continue in this control, the "rings" appointed their own henchmen to vacant positions, leaving out altogether the deserving workmen and competent craftsmen. "You vote for the machine or you lose your job," was the motto. Another reason for the rejection of the principle of municipal ownership—and it is one which is having weight on this side—was that it was simply a form of Socialism, and was being used by the Socialists as the medium for securing the adoption of other items of their programme. Public opinion on the Socialists' propaganda has lately been expressed in no uncertain manner in Germany. We shall have an opportunity in a few days of seeing what London thinks of it; and we shall be surprised if the result is not much the same.

The Tar (Patents) Solidifying Company, Limited.—A Company has been formed under this title, with a capital of £10,000, for the purpose of working the patents of Mr. S. G. Coulson, for the treatment of coal tar, with the object of rendering it sufficiently solid for safe transport in easily handled cases or packages, and so making it more portable and convenient for many purposes. The prospectus of the Company is advertised in this issue; but as our attention was only called to it and the process as we were going to press with this issue, we must delay for a week further reference, excepting to say that abstracts of the patent specifications were published in the "JOURNAL" for July 26, 1904, and July 3, 1906.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 489.)

Business on the Stock Exchange all last week continued light and quiet. It was account week, and was not wholly free from some anxiety. But the settlement proved to be a not very heavy affair, and on the whole was got through satisfactorily, though in the cases of two small operators the difficulties proved unsurmountable. Markets were a prey to a good deal of sensitiveness, and change succeeded change with about equal impetus; so that the net result was not far from a balance. A favourable influence was the better feeling in the American Market, which was much wanted; but a disagreeable feature was the depression in Home Rails, owing to the pertinacious attacks of those who would impose on the lines the obligation to run a multitude of workmen's trains at a loss. In the Money Market, after a short period of ease, a strong demand set in, which had the effect of stiffening rates up for short loans. Discount rates were similarly affected, and there was not much slackening off to be detected before the close of the week. Transactions in the Gas Market were at first quite devoid of animation; and the first half of the week was quieter than the average for some time past. But it quickened up a bit later on, although still remaining below a fair medium. There was no dominant tendency either way; but balancing losses against gains in quotations, the upward movements had rather the best of the game. Of course, the great coal question is an omnipresent reality; but there is every assurance that the responsible managers of gas companies will handle it with judicious calm. In Gaslight and Coke issues, the ordinary was very quiet, but a little disposed to advance. The opening prices *cum div.* were from 96¼ to 98¼, and afterwards *ex div.* from 95⅝ to 96½. The secured issues were far more active. Early prices *cum div.* were for the maximum 90 and 91; for the preference, 108¼ and 109; and for the debenture, 85 and 86. Later *ex div.* prices were for the maximum from 88 to 89⅛; and for the preference, from 106 to 107. South Metropolitan had a brisk opening; but transactions fell away as the days went on. Prices ranged from 128½ to 127 special *cum div.*, with one bargain *ex div.* at 124½. The debenture changed hands at 85 and 86. Commercials were not touched. In the Suburban and Provincial group, Brentford old was done at 263 and 265, ditto preference at 124½, British at 42½, Hastings 3½ per cent. at 100⅜ and 100⅝, and West Ham at 104⅝ and 105. The Continental Companies were little dealt in. Imperial changed hands at from 181 to 183, Union at 125 (a rise of a point), European fully-paid at 24⅞ and 24⅝ (a rise of ½), and ditto part-paid at 18¼. Tuscan debentures marked 102¾ and 103¼. Among the undertakings of the remoter world, Bombay new was done at 5⅛ and 5¼, Cape Town at 14½, Monte Video at 12, Primitiva at 8, ditto preference at 5⅛ and 5 3/32, ditto debenture at 95¼, River Plate at from 12¼ to 12½, ditto debenture at 96½, and San Paulo at 13½.

The closing prices are shown in our list on p. 489.

ELECTRIC LIGHTING MEMORANDA.

Further Laboratory Tests, with Regulated Voltage, on Nernst, Tantalum, and Carbon Filament Lamps—Cost of Flame Arcs—Recession from Normal Growth: Causes and Effects—Gas and Electricity in Railway Accidents.

The Institution of Electrical Engineers have given to the world an ample supply of material to show that, even with regulated voltages, the actual performance of the lamps with which electricity consumers are supplied falls terribly short of reputed performance. There was Mr. Paterson's paper to which we have recently been devoting some attention; and now we have one by Messrs. Haworth, Matthewman, and Ogley, of the Liverpool University. Hitherto, tests on Nernst and ordinary incandescent lamps have been mainly confined to the observation of their working on continuous current circuits; but the study of the behaviour of such lamps with alternating currents has been somewhat neglected. It was with a view to determine whether the working of such lamps on an alternating current circuit was in any degree different from that when using continuous current, that these three investigators conducted their tests. The greatest difficulty in making life tests on lamps is to keep the applied voltage constant; since, if this is not done, the value of the tests (the authors of the paper hold) is comparatively slight, unless the actual pressure variations are recorded. This is the exact point on which we disagree as to the value to the consumer of these laboratory conducted tests; seeing that the maintenance of a constant voltage is a condition under which the consumer is not privileged to use his lamps, and restless voltages have an injurious effect upon the useful life of his lamps. For these tests at Liverpool an apparatus was specially designed and made for automatically keeping a constant voltage.

The first tabulated results are from Nernst lamps, and carbon filament lamps; and a comparison shows a saving of 57 per cent. in watts per candle in favour of the Nernst lamp. But the percentage cost saving is much less than the percentage energy saving, on account of the frequent and expensive renewal of glowers and iron resistances. Against the saving in running cost must be placed the much higher capital outlay on the lamp, the large sizes in which it is manufactured, the time it takes to light, and the erratic life of the glowers. In fairness, however, it must be remembered that these tests are made with alternating currents, while the Nernst lamp appears to work much better with continuous current. In every case during the tests of the Nernst lamp, there were breakages. Looking at the detailed results in the table, it is found that the average watts per candle for the lamps varied as much as from 1·70 to 2·38—the average candle power of the lamp taking the lowest amount of current per candle power being the best (65 candles), and that of the lamp taking the highest amount of current per candle power being the worst (43·18 candles).

In the first series of tests of carbon filament lamps, faith is somewhat shaken in the price of the lamps being any criterion of good or indifferent performance. For here we have a lamp costing 7½d. giving an efficiency of 3·72 watts per candle, while one costing 16d. took 9·20 watts per candle. These are the extremes, and must not, of course, be taken as applying generally. But it does so happen in this set of tests, that a cheap carbon filament lamp showed the highest efficiency and an expensive one the lowest. Between the two efficiencies named, the lamps gave most erratic results one with the other, and between reputed and actual performance. The test in the cases already referred to were carried to 300 hours. In other tests with results recorded for the first, second, third, and (where the lamps did not fail) fourth 250 hours' use, the same variability was observed, with a greatly increasing consumption with age. The authors, indeed, have good reason for saying that the accepted consumption of 4 watts per candle is "generally the exception" on alternating current lamps. Levelling down to an average "the average watts per candle" for the seventy carbon lamps tested, it was 4·86; for the eight ¼-ampere lamps tested, 4·14; and for the six Tantalum lamps, 1·97. The ordinary ¼-ampere Nernst lamp of commerce is thus about 15 per cent. better than the average carbon lamp; while its life is about 560 hours. But the breakage troubles cannot be neglected. The average consumption of the Tantalum lamps tested was 60 per cent. less than that of the carbon lamps; and their average life was only 330 hours. Of course, it will be remembered that the makers of the Tantalum lamps do not recommend them for use on alternating current systems. Considering the results generally, they call to mind what Professor Ayrton said in the discussion on Mr. Paterson's paper, that the cost of lamps is of minor importance compared with a consumer's expenditure for energy. Such divergent results as the paper shows are thought to emphasize the need for standardization; but it must be submitted that the advantage of lamp standardization loses much of its value to the consumers while voltages are so variable.

The Birmingham Section of the Institution of Electrical Engineers has been discussing the relative costs of running electric lamps; and one of the speakers (Mr. A. Lindsay Forster) gave some computations as to the cost of using flame arcs. They are worth reproducing—

Cost of Running for 1000 *Hours on* 220*-Volt Direct-Current Installation.*

Flame Arc—9-ampere, 17-hour.

	£	s.	d.
2000 units, at 1½d.	£12	10	0
Chemical carbons	4	10	0
260 trims (wages)	2	3	4
Repairs	2	8	0
Four lamps	£21	11	4

Per lamp, £5 8s.

Flame Arc—7-ampere, 40-hour (magazine).

	£	s.	d.
1650 units, at 1½d.	£10	6	3
120 trims (wages)	1	0	0
Chemical carbons	1	10	0
Repairs	3	0	0
Four lamps	£15	16	3

Per lamp, £3 19s.

It will be remarked, in the first place, that the charge for current is placed at the low figure of 1½d. per unit—a price at which, for lighting purposes, few electricity undertakings can afford to supply. The cost of the chemical carbons—remembering that the figures are only for 1000 hours—shows their expensiveness; and the item for repairs for 1000 hours' use is heavy. But they are not heavier than the real expenditure. It will also be remarked that such matters as charges for capital cost and renewal (we suppose they are considered too trivial to notice) are not deemed worthy of inclusion, though the figures quoted last week as to the cost of the installation in Oxford Street indicate that, in considering a system of flame arc lighting, these charges are not altogether negligible quantities. It will also be obvious from the number of trims the lamps require in 1000 hours that "wages" for lamp trimming in the electrical industry is a matter that ought to receive the consideration of the trades union—if the men have one. We have seen as many as three men wrestling with the trimming of a flame arc at Blackfriars Bridge approach. Regarding the respective charges per lamp of £5 8s. and £3 19s. (without capital and renewal charges), if the lamps are intended for public lighting, and if the old lighting tables of 3940 hours or 4300 hours per annum are adhered to, the 1000-hour charges per lamp have to be multiplied by four to get at the annual charge. But there appears to be a disposition for the old public lighting hours to shrink considerably in number for electric lighting, at the behest of electricians, in order to obtain economy. Even then public lighting accounts rise with extraordinary sprightliness.

It is observable that electricians are all too fond of accusing "the gas people" of exaggeration. They can give no one credit for honesty but themselves; and we are inclined to think that they do not all believe in their own honesty. We have here in

Mr. Lindsay Forster's remarks a point showing an exaggerated view as to the cost of high-pressure gas-lighting. This instructor of electricians in the matter of cost says: "High-pressure gas (say, 350-candle power gas), at 1s. 9d. per 1000 cubic feet, costs, including mantles, attendance, bye-pass, &c., per 1000 hours, £4 6s. 3d." Now a 350-candle power high-pressure lamp consumes 10 cubic feet an hour, or 10,000 cubic feet in 1000 hours. 10,000 cubic feet at 1s. 9d. per 1000 = 17s. 6d., so that Mr. Forster allows £3 8s. 9d. per 1000 hours for mantles, attendance, and bye-pass. Gas authorities would be pleased to do any amount of business on these lines, as for public lighting per annum they would be receiving about £17 5s. per 350-candle power lamp. When gas was 2s. 2d. for public purposes, the Gaslight and Coke Company were quoting £18 for about 4000 hours' lighting for 1000-candle power lamps, including maintenance and special gas compression, &c. A slight difference truly between actual payment and Mr. Forster's hypothetical figures!

It may be taken that the St. James' and Pall Mall Electric Light Company are representative of undertakings supplying in areas particularly rich for business in electricity for ordinary purposes; and, therefore, that at any rate some of the causes operating in their case to produce a diminished income apply, in a degree, to most other electricity undertakings. The effect in the case of this Company has been to reduce the dividend from 14½ per cent. in the eight years preceding 1905, to 12½ per cent. in 1905, and to 10 per cent. in 1906. The salient causes producing this effect have been (according to the Chairman of the Company) the large amount of rebuilding that has been proceeding in the district, the heavy charges that have been incurred for parliamentary law expenses, and the general fall in the prices obtained for electricity. It has not been observed by the occasional visitor to the district served by the Company that rebuilding has been proceeding to such an extent that it should have occasioned so dire an injury to the business as is pictured, or that it should not have been compensated by new business. The increase in the parliamentary expenses, can better be understood; and we know that the pressure of competition (nothwithstanding journalistic sneers) has tended to force down prices charged to consumers. The Company are not now enjoying the former "normal growth" of business; so that it may be assumed they are working in the neighbourhood of the "saturation point" of electricity for lighting purposes. But it is confessed it is the "normal growth" that is urgently needed to put the revenue account in a more favourable light; and it is evident that the Company are looking elsewhere than to lighting to try to recover the "normal growth." But it is interesting to see how recovery is being sought. While the general fall in price has had a remarkable effect upon the revenue—the average price is now 3·21d. per unit, as against 3·42d. per unit in 1905—the Company are trying to produce equilibrium with the old normal growth by selling electricity for power and heating purposes at a flat-rate of a penny per unit! At this price, the use of radiators is, the Chairman asserts, rapidly extending. Then as to motors, the Company are placing these in consumers' premises at a "reasonable rate" for rent and maintenance; and it is proposed to extend this system to arc lamps, ventilating-fans, &c. But what is the character of the field for motive power? The Chairman replies that the Company have not, so far as their district is concerned, found evidence to support the sanguine estimates of the possible demand for power in London on which the large schemes before Parliament are based. Anyway, with this pushing of business at the penny flat-rate for purposes other than lighting, we can see the average price of 3·21d. per unit further falling; and as the average drop of 0·21d. between 1905 and 1906 represents, on the whole output, no less than £7200, of which the increased output only recouped £4000, the shareholders may see some further peculiar effects from the adoption of the flat rate of 1d. for power and heating. The use of metallic filament lamps is also charged with responsibility for a reduction in output; but the temporary loss, it is hoped, will be counterbalanced by popularization. That is a question of time, as the experience of the gas industry with the incandescent mantle has proved. Meanwhile, it is another bar to restoration of that "normal growth" so anxiously desired, and so imperatively necessary for this as for other electricity suppliers.

A short time ago, one of our electrical contemporaries in a moment of wild imagination talked at random of the horrors that had accompanied the adoption of gas for train lighting—speaking of people having been roasted alive in the sight of rescuers, and piling up the agony in a most vivid fashion. We asked for chapter and verse for this terrible state of affairs; but it was not forthcoming. Railway accidents are common in America; and electricity appears to take an important part in them. Writing upon the latest disaster near New York, the correspondent of a morning contemporary says: "Two of the cars were overturned, and burst into flames, their woodwork catching fire from contact with the electric rail, and many of those who were not killed outright, were burned alive as they lay pinned beneath the wreckage." Perhaps our electrical contemporary, when writing a few months since, had not got hold of the correct story.

The London and Southern District Junior Gas Association will hold their next meeting, at the Cripplegate Institute, on Wednesday, the 27th inst., when the business to be transacted is to discuss a list of questions sent in.

COAL PRICES AND THEIR RISE.

[COMMUNICATED.]

ACCORDING to the "Iron and Steel Trades Journal" [*vide* "JOURNAL," Jan. 29], an important step is being taken by the owners of gas-coal pits in the Midlands, working in combination, to considerably raise the price of gas coal. It is further hoped that fully 2s. 6d. per ton advance will be secured when the contracts for delivery in 1907-8 come to be made. Whether the colliery owners will be able to secure this advance, is another matter; and it is quite on the cards that they will be defeated. That the fluctuation in the price of gas coal should be equally as great as that in the price of steam coal, is manifestly unfair; for the annual consumption of gas coal varies but slightly from year to year, while that of steam coal fluctuates to a considerable extent. Consequently, it is not surprising that the price of steam coal should rise in times of brisk trade; but that gas coal should rise in the same proportion is totally unreasonable. In fact, it is merely a movement in sympathy, just as, in Stock Exchange parlance, we are told that "the Home Railway Market moved up in sympathy." It is a common occurrence, when a favourable development takes place concerning one railway only, to see all the other stocks in the same group advancing in market value. This is chiefly the cause of the rise in the price of gas coal—indeed, there can be no other reason.

A very good practical illustration of how to deal with a monopoly of a raw material was given about a year ago by the South Metropolitan Gas Company. The result was so entirely successful, not only for that Company but for the whole gas industry, that it becomes an object-lesson, and one that might well be acted upon in dealing with this greater problem. Sir George Livesey, in his speech to the shareholders of the Company, related the reasons that had induced the Board to purchase a monazite sand property in Brazil, and explained that the material—thorium—from which mantles are made was entirely in the hands of a "convention" comprised of four chemical manufacturers. It was, he said, with the determination to remove them, and not only them but the whole gas industry, from this precarious position that they carried out the transaction. The price of thorium was immediately reduced (probably partly through this action) from 53s. to 27s.—a reduction so great that, at the reduced price, it does not pay the Company to work the property. The primary object for which the property was purchased has been fulfilled; and, besides, there is no reason to suppose that the price of thorium will always remain at a low figure. Cannot the results achieved in this case be likewise repeated in the case of the more important raw material, coal? Would it not be possible for a Syndicate to be formed, under the auspices of the principal gas undertakings, to buy up some of the gas-coal properties, with the object of ensuring a uniform price? The uniformity of coal prices is the great desideratum—without it, the price of gas must fluctuate. A repetition of 1900, when the price on the Tyne rose from 8s. to 16s. per ton, is greatly to be avoided.

In other respects the gas companies are particularly well situated at the present time to resist the colliery owners; for the new Metropolitan burner makes it possible to manufacture a much larger quantity of carburetted water gas—amounting to about 20 or 25 per cent.—without using any more oil than previously; and should the price of coal be unduly advanced, the quantity bought from the colliery owners will doubtless be considerably reduced and a larger proportion of water gas made to supply the balance. A great deal has been heard lately of blue water gas plants; and if they are only half as successful as they are said to be, they will doubtless be erected in many works during the next few years. The great advantage of these plants over the ordinary carburetted water gas plant is, of course, the vastly increased yield of gas per ton of coke.

The colliery owners would be well-advised to look into the details of recent developments in gas manufacture, as they will find that the strong tendency among all progressive and up-to-date engineers is to increase the capacity of water-gas plant at the expense of the coal-gas plant; and there is not the slightest doubt but that any undue rise in the price of coal will materially hasten this tendency. *A propos* of this, it is interesting to quote from Mr. Corbet Woodall's speech at the recent meeting of the Gaslight and Coke Company, in which he said: "In our own case, we have already replaced coal to a certain extent by oil for the manufacture of gas; and we can carry this replacement still further, *if necessary* [my italics]. While we dare not at present contemplate reducing the charge for gas, we are resolved that nothing short of absolute necessity will induce us to raise it."

To those who read between the lines in the above quotation, it will be quite clear that, in the event of the price of coal being forced up, a much larger proportion of water gas will be made; for it is well known that whenever high prices for coal and coke

	s. d.	s. d.	s. d.	
Price of coal (delivered) . .	11 6	14 0	16 0	Increased
,, coke	13 0	15 6	17 6	Cost.
	d.	d.	d.	d.
Net cost of coal per 1000 c. ft. of gas sold.	5·68	6·92	7·90	2·22
Cost of coke per 1000 c. ft. of water gas sold. . . .	3·15	3·75	4·24	1·09

prevail (and they always fluctuate together) it is more economical to make water gas. The table on p. 459 shows that, supposing coal and coke were to rise 4s. 6d. per ton in price, the increased cost of making water gas would be only half as much as the increased cost of making coal gas; the reason, of course, being that the cost of coal in making coal gas is a larger item by nearly 100 per cent. than the cost of coke in making water gas.

With regard to the coal contracts for the current year, a noteworthy piece of advice is given in the South Metropolitan Gas Company's report, which, if acted upon, could not but be attended with beneficial results: "The gas companies are probably the best customers of the collieries that supply this class of coal; and, instead of acting as isolated units, they should act unitedly and refuse to pay unreasonable prices." This suggestion emanates from the most experienced of sources; and in the event of it being adopted, each company would be in a vastly improved position to deal with the colliery owners.

A GAS CONTRACT BASED ON CALORIFIC VALUE.

The Colombo Gas and Water Company, Limited, as recently announced in the "Journal," have made a contract with the Municipality of Colombo which stands unique in the history of gas supply. Taking advantage of what is expected to be the permanent return to this country, after 14 years in the East, of Mr. S. N. Wellington, the Company's (late) General Manager, we have obtained from him some further particulars respecting the new contract, which cannot fail to be of interest in view of the minimum prescribed for the calorific value and the candle power of the gas to be supplied for public purposes. The former contract for gas prescribed an illuminating power of 15½ candles; while the new one defines a 10-candle gas; but the test to be applied is for thermal value. Professor Boys' calorimeter is the agreed instrument to be used in making the tests; this being, as readers are aware, the calorimeter ordained by the Gas Referees for use in the London gas-testing stations for information only, and not for penalty purposes. The Colombo gas that is supplied under the contract is to have a value of not less than 400 B.Th.U. The Company undertake to maintain a 60-candle power light by the incandescent burner in the ordinary street lamps; and they find that, even with an 8-candle power gas, they can, consuming 3¼ cubic feet an hour, obtain a light of 72-candle power, with a carefully adjusted No. 3 Kern burner. Therefore between 72 and 60 candles, there is an ample margin. Considering these figures, Mr. Wellington's deliberate opinion is that the general future standard of illuminating power will have to be as low as, if not lower than, 10 candles; and while that would enable the retention of the lighting business, it would also give additional strength in the competition for power and heating. The conditions in Colombo are very severe for maintaining, without any special provision, incandescent gas-burners in proper condition; but, with special provision, and under stress of conditions that do not prevail in this country, the Company's average consumption of mantles—bearing in mind the minimum of 60 candles per burner—is only nine per lamp per annum. The Municipality do not give the Company any latitude for lax dealing with the public lighting; for they have an inspector whose sole duty is, by the aid of a motor car, to perambulate the streets to see that the lamps are kept well up to the high standard specified.

The necessity for a specially constructed lantern to enable compliance to be constantly made with the stringent conditions imposed for street lighting—regarding which, as will have been already seen, the Municipality are keenly solicitous—led to the adoption of a lantern specially designed by Mr. Wellington, and made to his drawing by Messrs. Pintsch and Co., of Berlin. The lamp is called the "Bombay" improved; and it has also been largely installed, under Mr. Wellington's supervision, in the city from which it takes its title. The lamp has both primary and secondary air supplies; and it is absolutely wind, rain, and insect proof—all necessary qualities in Colombo. Excepting the main streets once in the afternoon (and this has no effect for more than, say, an hour), the streets are not watered; and therefore dust is plentiful. The proof that the lantern is wind proof is amply testified to by the tests made with one, fitted complete with mantle; the blast applied being by the aid of a powerful sirocco fan driven by a 14-horse power gas-engine. Altogether there are 2500 street lanterns in Colombo; and with the extensions now being made, there will be, by the end of this month, something like 90 miles of main pipes in the streets. As an example of good modern street lighting, Mr. Wellington is of opinion that Marine Parade in Colombo will be hard to beat—the 33 incandescent gas-lamps situated there being of 600-candle power each, and spaced only 50 yards apart.

Speaking of the carbonizing operations in Colombo, Mr. Wellington informs us that the production is 62 million cubic feet per annum, though there is capacity for turning out double the quantity when the necessity arises. It has been part of his work during late years to completely modernize the whole plant. Gibbons's latest type of regenerative settings have been adopted; and their working is highly spoken of by Mr. Wellington. The coal carbonized is mainly Indian coal; the Bengal variety of which, known as "Sanctoria" gas coal, is specially mined for three Gas Companies—the Bombay, the Oriental (Calcutta), and the Colombo. The Company also use Japanese "Moji" coal, and a proportion of Australian ("Hetton") coal. The last-named Mr. Wellington speaks of as being very rich coal for gas making; and he knows of nothing like it in England. It is almost free from sulphur; only containing 0·23 per cent.

Another point that is highly interesting is the particular attention that we learn the Company give to the lighting fittings of their consumers; and they find they obtain and maintain, through their action, the goodwill of the consumers. It is a system of maintenance, including the supply of mantles; and it is practically a compulsory system. The Company keep a special ledger for the maintenance work; and they place from the charge for gas (say) 2 rupees per month to the credit of each ordinary consumer, and, on the debit side, are entered the cost of mantles and labour charges. An ordinary gas-jet is unknown in Colombo. There is, on a balance, a slight loss; but it is fully compensated for by the large increase in the sale of gas. The Company have the competition of an American Electricity Company; but they find this system of maintenance effectual in resisting inroads upon their business. In the mountain capital of Ceylon (Kandy), the Colombo Gas and Water Company also supply electricity for lighting and power purposes; and in conjunction with this branch a variety of electrical installation work is carried out.

In view of Mr. Wellington's return to this country, we may mention that he was trained in gas engineering and management at the Norwich works of the British Gaslight Company—under Mr. Fred. L. Linging, M.Inst.C.E.; and, in addition to his qualifications in gas, he is an Associate-Member of the Institution of Electrical Engineers, and a Fellow of the Chemical Society. We wish him success in his intention to now pursue work in the gas and electrical profession in this country.

PERSONAL.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. J. Ferguson Bell, the Engineer and Manager of the Derby Gas Company, was transferred from the class of associate member to that of member.

At the meeting of the Burton-on-Trent Town Council last Wednesday, it was decided, on the recommendation of the Gas and Electricity Committee, to fill the vacancy in the management of the gas-works caused by the death of Mr. F. L. Ramsden by retaining the services of Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, to inspect the works four time in the year for the sum of fifty guineas, with a further payment of five guineas for any extra visit he may be required to make—his services to include the general supervision of the works and the advising of the Gas Committee; and by appointing Mr. Sydney Ramsden, son of the late Manager, as Assistant-Manager for one year, at a salary of £180, with house, &c., on condition that he devotes the whole of his time to the duties of the position.

OBITUARY.

We regret to record the sudden death last Wednesday, in his 68th year, of Mr. Alfred Todd, late Managing-Director of the Whitby Gas Company. Mr. W. M. Galleway is Secretary and Manager of the Company. Mr. Todd's connection with the Whitby Gas-Works dates back to the year 1860, when the undertaking was owned by the late Dr. Atkinson, of Hull. On the Company's incorporation in 1871, Mr. Todd was appointed Secretary, which position he held until the year 1899, when (on retiring from the secretaryship) he was appointed Managing-Director, and continued to act in that capacity until his death. He was a man of great energy and conspicuous ability; and though he never associated himself with public offices, he was untiring in his efforts on behalf of religious and philanthropic objects.

Dessau Vertical Retorts.

The "Journal für Gasbeleuchtung" for the 9th inst. has a short note on the Dessau vertical retorts, to the following effect: "The town of Ludwigshafen has decided to order from the Dessau Vertical Retort Company three settings of vertical retorts. These settings ought to be completed in good time for those who attend this year's meeting of the German Association of Gas and Water Engineers at Mannheim (which is on the opposite bank of the Rhine to Ludwigshafen) to witness them in operation. Including this order, the Dessau Vertical Retort Company have completed or have in hand 100 settings of vertical retorts, in the following places: Dessau, Potsdam, Oberspree (near Berlin), Dortmund, Cologne, Brandenburg, Duisburg, Mariendorf (near Berlin), Ludwigshafen, Offenbach, Barcelona, and Zürich. The installations at Barcelona and Potsdam are already in operation, and giving satisfaction to the Managers of the works. Of the other installations a large number will come into operation this month. The rapid introduction of this system of setting shows conclusively what favour the vertical retort enjoys with gas-works' administrations. We have from time to time directed attention to the importance of the vertical retort, and hope shortly to be in a position to give figures of their continuous use at various gas-works. The progress is so much the more gratifying as the constructors of the various competing English systems have not yet succeeded in getting beyond experimental trials."

MR. PATERSON ON LIGHT STANDARDS.

Observations by Mr. A. G. Vernon Harcourt.

On the occasion of the adjourned discussion on Mr. C. C. Paterson's paper, at the Institution of Electrical Engineers, on "Investigations of Light Standards and the Present Condition of the High-Voltage Glow-Lamp," a report of which appeared in the "JOURNAL" last week, it was mentioned by the President that a written communication on the subject had been received from Mr. A. G. Vernon Harcourt, and that it would be reserved for publication in the "Journal" of the Institution. As, however, Mr. Harcourt's remarks, of which we also received a copy, have been published in the current number of the "Electrician," we are free to complete our report by giving them.

Mr. Harcourt pointed out that the knowledge that atmospheric conditions have important influences on the candle power of flame standards is not quite recent. It must, he said, have been present to the minds of all who had thought out and arranged these standards, though an accurate determination of the correction to be applied for such atmospheric variations as were material, was no easy task. For the approximate measurement of the light of flames such as that of an oil-lamp or a gas-burner, the probability that the standard flame and that whose light it was used to measure would be similarly affected by atmospheric variations, was sufficient to make the correction of each unnecessary. When, however, a flame standard was to be used for standardizing glow-lamps, the corrections to be applied must be determined; and Dr. Liebenthal and Mr. Paterson had not, he thought, discovered an error, but had done an essential service which few had such good means of doing, in making these determinations. In the year 1885, he (the writer) examined the influence on the one-candle standard, which he had proposed, of variations in atmospheric pressure, by comparing it with a small glow-lamp, the current of which was adjusted by means of an electro-dynamometer. He found that the pentane flame, which gave a light of one candle when its height was 63·5 mm. and the atmospheric pressure was 760 mm., must be raised or lowered in inverse proportion to the rise and fall of the barometer for its light to be constant. His experiments upon the influence of atmospheric moisture began earlier—in 1879. He had then no glow-lamp for measurement, and only by the help of his one-candle flame compared the light given by a stored sample of coal gas, burning from a "London" argand burner in a box photometer when the air was dried and undried. Trays of quicklime were placed beneath the opening at the bottom of the box, and the light was 16·6 candles; the trays of lime were removed, and the light was 15·9 candles. Another day the gas was tested, and the yield of light was found to be 16·2 candles. The trays were then filled with slightly warm water, and the light was 15·4 candles; the trays were removed, and the light was 15·85 candles. Many such observations were made; but the attempts to measure the humidity with wet and dry bulb thermometers were unsatisfactory. It was certainly very difficult to treat the air in any way without interfering with its free flow, and thus affecting the light of the burner. He agreed with Mr. Paterson that it was best to wait for natural variations. There was still another atmospheric condition not named by Mr. Paterson, whose effect he hoped Mr. Paterson would investigate —viz., temperature. By the variation of this condition, the flame standard and the glow-lamp were both, however unequally, affected. A 10-candle gas-lamp was placed in the centre of a cylinder, 18 inches in diameter and 20 inches in height (within which was a long coil of metal pipe, through which hot or cold water could be run), lined inside with black cloth. An 8-inch opening in its lid gave free passage to the air. Two small lateral openings served for the beam to be measured and for observation of the flame. At temperatures of 36°, 32°, 29°, and 24°, the light was 10·6, 10·4, 10·3, and 10·2 candles. The temperature of flame was far removed from that of the air; but the principle of the hot blast came in, and particles of carbon were measurably brighter at (say) 1510° than at 1500°. That the glass envelope of a glow-lamp was hotter on a warm day was certain. The exchange of temperature between it and the filament through a nearly vacuous space, shown by the warmth which the glass maintained, though continually cooled by the air around it, must be much slower than that which was due to the free and rapid access of air to a flame. Was the effect of the temperature of the air around on the light of a glow-lamp measurable or not? If the answer was not already known, it could easily be obtained by experiment. Since, when the air was warmer, the proportion of steam in it was generally greater, and since the light of a flame was increased by warmth and diminished by a greater proportion of steam, these simultaneous variations must to some extent balance one another. But that which was needed, and which had already been partly supplied by Mr. Paterson, was a formula for correcting the photometric results obtained on comparing a glow-lamp with a particular flame standard, by which allowance would be made for the variations of pressure, temperature, and moisture, much as the observed volume of a gas measured over water was now corrected for these same variations.

Mr. James Dickie, of Irvine, N.B., the Secretary and Treasurer of the Irvine District Water Board and of the Irvine Gas-light Company, left personalty, apart from real or settled estate, entered at £54,631.

Measurement of Natural Gas.

Statistics of the quantity of natural gas consumed in the United States will be taken next year by the United States Geological Survey. Up to the present time, only the value of the gas has been ascertained. The adoption of this method will make it inconvenient, if not impossible, to refer back for purposes of comparison to the figures of previous years; but it will result in more direct knowledge of the capacity of gas areas to maintain a commercial supply of gas for a certain number of years. An effort will be made to collect and publish statistics showing the total acreage held by natural gas companies and that operated by them, with the total quantity of gas consumed in the different States. Owing to the fact that gas wells from different fields are connected to the main pipe-lines, and that gas is only measured where it is consumed, it is almost impossible to procure exact figures as to the quantity of gas produced from any particular district. When natural gas was first brought into use, an idea prevailed that the supply was inexhaustible. It was sold at low rates, and usually without measurement. This method encouraged waste, and was shortly abandoned by the larger companies. They introduced meters, and sold their gas at a rate per 1000 cubic feet by measurement. There were, however, so many smaller companies who did not measure the gas consumed, that it was impossible to secure reliable figures of the production and consumption of natural gas. For this reason, the statistics of this product have been collected in terms of value only. In taking value as a basis for statistical record, an incorrect idea is given of the actual production of the gas-fields. Experience has demonstrated that there is a limit to the production of all fields, and those who use the gas have learned that unnecessary waste must be prevented. At present nearly all the gas is sold by measurement; and it is believed that the time has come when it is possible to procure statistics of the quantity consumed.

The "Circular of Inquiry" Again.

It is some time since we have had to notice this trouble of the gas profession—the attempt to get "on the cheap" professional information that should be paid for by those requiring it. What possible claim can the Clerk to the Goole Urban District Council have upon (say) the Engineer and Manager of a South-Country Gas-Works to justify him asking replies to fifteen separate queries, and expecting an hour and more of an official's time to be thus occupied? It is not a question here of one engineer making a few personal inquiries in a friendly way of a brother engineer, but of a Corporation "office" official sending circulars to scores—possibly hundreds, as the forms are printed ones—of individuals in an altogether different sphere of life to himself and evidently expecting to get what he asks for. The covering letter says: "I propose to summarize the replies received," and it is to be hoped that the response to his invitation will be so scanty as not to justify the incurring of further expense in the matter. Here are the queries: 1.—Name of council, corporation, or company? 2.—Population of district? 3.—Number of gas consumers: (*a*) ordinary meters? (*b*) prepayment meters? 4.—If gas and water management combined, show apportioned: (*a*) salary of gas engineer and manager? (*b*) salary of water engineer and manager? (*c*) office staff allowed gas and water engineer and salaries paid each? 5.—Is salary inclusive, or is house or coal, gas, &c., provided? 6.—Total gas made? 7.—Gas sold? 8.—What is net cost per 1000 cubic feet of gas, delivered into holders, including the whole of the manufacture maintenance, and purification costs, less residuals? 9.—Water pumped per annum? 10.—Capital: (*a*) gas-works; (*b*) water-works. 11.—Price of gas per 1000 cubic feet? Water (*a*) domestic? (*b*) trade supply? 12.—Total income from all sources: (*a*) gas department? (*b*) water department? 13.—Total expenditure: (*a*) gas? (*b*) water? 14.—Are all extensions and alterations to gas or water plant carried out by engineer and manager, including preparation of plans and specifications, and is same included in his salary or special commission? 15.—Have you a consulting engineer to advise on all works as proposed?

Lord James of Hereford has accepted the unanimous invitation of the Coal Conciliation Board of England and North Wales to act as independent Chairman for the next three years, for which the Board has been reconstituted.

Sand in the water supply of the city of Evans (Colo.) has been overcome by a method described as follows by Mayor John H. Behrens: The supply was drawn originally from an 8-inch well sunk 108 feet deep into a stratum filled with soft water. The water rose in this casing within 10 feet of the ground surface, and was drawn from it with a large pump. The latter was so powerful that it sucked sand into the cylinder, where serious trouble was caused. A concrete curb or well, 12 feet in diameter and 36 feet deep, was then sunk, and four 6-inch wells were driven in its bottom to a depth of 106 feet into the stratum containing soft water. The bottom of the curb or well was then concreted to keep out the hard surface water, and the 6-inch pipes were cut off about 6 feet above the concrete bottom. The water issues from them freely into the large well, which serves as a suction chamber for the pump. This method of obtaining the water has prevented all the former troubles with sand.

ESTIMATING STREET ILLUMINATION.

An article by Dr. Hugo Krüss, of Hamburg, on methods of calculating the illumination provided in streets, appeared in a recent issue of the "Journal für Gasbeleuchtung;" and the following is a full summary of the author's remarks.

Dr. Krüss agrees with Professor Drehschmidt that the most suitable and correct method of ascertaining the amount of illumination consists in making measurements on the spot with a convenient form of photometer. But at the same time it is very interesting to calculate the illumination, because the investigator is then untroubled by irregularities in the behaviour of the lamps, and he can also, by theoretical considerations, obtain a better mental picture of the conditions which make for uniformity. The surface which may be regarded as receiving light is one lying in a vertical plane parallel with the direction of the street; for, as Dr. Drehschmidt has pointed out, satisfactory street illumination depends less on the light that falls upon the ground than on that which impinges upon an imaginary vertical surface crossing the road obliquely. When a person reads or studies a plan, he intentionally places himself in such a position that the object receives the best illumination; but in walking or driving along a street he is chiefly dependent on the light falling on those parts of pedestrians or vehicles that are turned towards him.

Calculation of the illumination is an easy matter. In the first place suppose the source of light, J, and the receiving surface, B, are both in the centre of the carriage way, as represented by fig. 1. Let the vertical distance of the receiving surface above the ground level be *h*, the vertical height of the light above B be H, the direct distance between light and receiving surface be E, and the horziontal distance between the base of the light and the surface be L. If the illuminating power of the light is J, the illumination received by the surface B, and the angle with the normal at which the rays strike the surface α; then

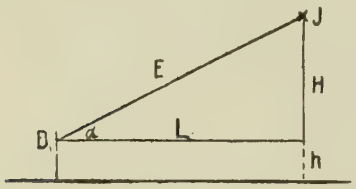


Fig. 1.

$$\tan \alpha = \frac{H}{L},$$

$$E = \frac{L}{\cos \alpha},$$

$$B = \frac{I}{E^2} \cos \alpha = \frac{I}{L^2} \cos^3 \alpha.$$

But suppose the receiving surface is at some distance from the vertical axis of the light across the street as well as along it—the light being in the centre of the carriage way and the receiving surface above the footpath—as represented in [the three-dimensional] fig. 2. Let the distance across the street from the light J to a line L drawn normally in respect of the receiving surface be D, and the diagonal of the vertical rectangle formed from D and H be F; then E is the hypothenuse and F and L [not marked in the diagram] are the other two sides of a right-angled triangle. Hence

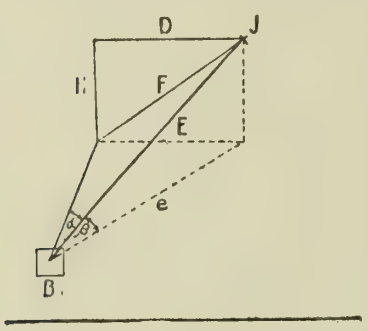


Fig. 2.

$$F = \sqrt{(D^2 + H^2)}$$

$$\tan \alpha = \frac{F}{L};$$

B being calculated as before. It should be noticed that the angle below the horizontal at which the rays issue from the source of light—viz., β—is not identical with the angle α at which they strike the receiving surface. For

$$\tan \beta = \frac{H}{e}, \text{ where}$$

$$e = \sqrt{(L^2 + D^2)}.$$

The additional amounts of light which fall upon the imaginary vertical receiving surfaces by reflection from the fronts of houses and the plate-glass windows of shops are better ignored in making the calculations, because these factors are too uncertain to reckon upon.

The results obtained with the aid of the foregoing formulæ become specially instructive if numerical data are employed which correspond with practical conditions; and therefore in the following lines values are used almost identical with those obtaining in Leipzigerstrasse, Berlin, where the illumination has already been measured by Dr. Drehschmidt. The lamps may be assumed to be erected either centrally in the carriage way, as shown in fig. 3, or alternately on either side, above the kerbs, as shown in fig. 4, at a distance of 19 ft. 8 in. from the centre—the actual distance in Leipzigerstrasse varies, it seems, from 18 ft. to 18 ft. 9 in. The receiving surfaces may either be in the centre of the roadway or along the kerbs, in the positions indicated by the inner parellel lines of the diagrams. The lamps may be taken at their actual height above the ground of 29 ft. 6 in., or 24 ft. 6 in. above the receiving surfaces; and, for simplicity, they may be assumed to be 30 metres (33 yards) apart, instead of the actual distance of 36 yards. Figs. 3 and 4 are drawn longitudinally to scale, the small graduations being 5-metre distances.

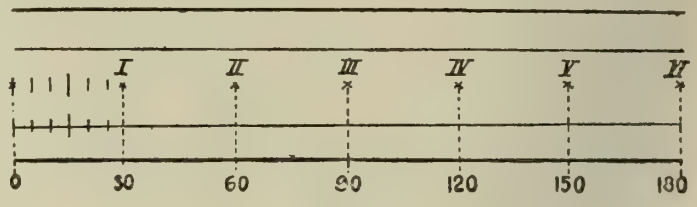


Fig. 3.

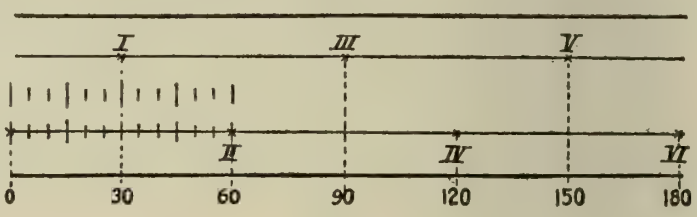


Fig. 4.

Four different arrangements may, therefore, be imagined: (*a*) Both lamps and receiving surfaces centrally over the roadway, (*b*) the lamps over the roadway and the receiving surfaces over the kerbs, (*c*) the lamps over the kerbs on alternate sides, and the receiving surfaces centrally over the roadway, and (*d*) both receiving surfaces and lamps over the kerbs—the lamps being on alternate sides of the road. From the present aspect cases (*b*) and (*c*) are identical, because the illumination at any particular spot depends only on the distance of the light and the angle at which the rays issue from it. The practical advantage of having the lamps on either side alternately—due to the avoidance of shadows all lying in the same directions—does not affect the present question. In order to ascertain the illumination falling on the receiving surfaces in cases (*a*), (*b*), and (*c*), calculations are made for positions along the street every 5 metres from the zero point, at the extreme left of the two figures, to a spot 5 metres from the first lamp, and then every 1 metre to its base. Further calculations between Lamps I. and II. are not necessary, since (as Table I. shows) the figures recur. In case (*d*), however, the calculations must be made over a double distance—*i.e.*, as far as Lamp II., in the manner indicated by Table III. The figures given in the tables are meterkerzen or lux—a lux being equal to 0·0845 candle-foot. The figures contained in Table I. are plotted diagrammatically in fig. 5, those of Table II. in fig. 6, and those of Table III. in fig. 7.

Table I.

Lamp.	Angle of Emission.	Position of Receiving Surface. 0	5	10	15	20	25	26	27	28	29	30
I.	14·0—90·0	2·03	2·81	4·10	6·36	10·24	13·66	13·03	11·39	8·55	4·73	..
II.	7·1—14·0	0·54	0·64	0·77	0·95	1·19	1·56	1·61	1·70	1·80	1·91	2·03
III.	4·6— 7·1	0·24	0·27	0·31	0·35	0·40	0·46	0·48	0·49	0·51	0·53	0·54
IV.	3·6— 4·6	0·14	0·15	0·16	0·18	0·20	0·22	0·22	0·23	0·23	0·24	0·24
V.	2·8— 3·6	0·09	0·09	0·10	0·11	0·12	0·13	0·13	0·13	0·14	0·14	0·14
VI.	2·4— 2·8	0·06	0·07	0·07	0·07	0·08	0·09	0·09	0·09	0·09	0·09	0·09
VII.	..	..	..	..	..	..	..	..	..	..	..	0·06
Total . . .		3·10	4·03	5·51	8·02	12·23	16·12	15·56	14·03	11·32	7·64	3·10

Table II.

Lamp.	Angle of Emission.	Position of Receiving Surface. 0	5	10	15	20	25	26	27	28	29	30
I.	13·8—51·3	1·90	2·60	3·65	5·31	7·50	7·88	7·10	5·89	4·24	2·22	..
II.	7·1—13·8	0·53	0·63	0·76	0·92	1·15	1·46	1·54	1·63	1·72	1·81	1·90
III.	4·8— 7·1	0·24	0·27	0·31	0·35	0·40	0·46	0·47	0·49	0·50	0·52	0·53
IV.	3·6— 4·8	0·14	0·15	0·16	0·18	0·20	0·22	0·22	0·23	0·23	0·24	0·24
V.	2·9— 3·6	0·09	0·09	0·10	0·11	0·12	0·13	0·13	0·14	0·14	0·14	0·14
VI.	2·4— 2·9	0·06	0·06	0·07	0·07	0·08	0·08	0·08	0·09	0·09	0·09	0·09
VII.	..	..	..	..	..	..	..	..	..	..	..	0·06
Total . . .		2·96	3·80	5·05	6·94	9·45	10·23	9·54	8·47	6·89	5·02	2·06

It should be noted that, although these figures and curves apply primarily to the numerical conditions previously stated, yet they may be used in considering the illumination in any street, provided only that the ratio between the height of the lamps above the receiving surfaces to the distance between the lamps, remains unaltered at the specified value—viz., as 7·5 : 30, or as 1 : 4. If the lights are more powerful, or if they are lower and correspondingly closer together, the figures only require multiplying by a constant factor—the curves remain the same

TABLE III.

Lamp.	Angle of Emission.	Position of Receiving Surface.																				
		0	5	10	15	20	25	26	27	28	29	30	35	40	45	50	55	56	57	58	59	60
I.	13·1—32·0	1·45	1·78	2·16	2·49	2 50	1·70	1·42	1·10	0·74	0·38	..	..	..	..	..	..	..	..	..	..	..
II.	7·1—90·0	0·54	0·64	0·77	0·95	1·19	1·56	1·61	1·70	1·80	1·91	2·03	2·81	4·10	6·36	10·24	13·66	13·03	11·39	8·55	4·75	..
III.	4·7—13·1	0·23	0·26	0·29	0·33	0·37	0·43	0·44	0·45	0·47	0·48	0·49	0·57	0·67	0·80	0·96	1·18	1·22	1·27	1·33	1·38	1·45
IV.	3·6— 7·1	0·14	0·15	0·16	0·18	0·20	0·22	0·22	0·23	0·23	0·24	0 24	0·27	0·31	0·35	0·40	0·46	0·48	0·49	0·51	0·53	0·54
V.	2·9— 4·7	0 09	0·09	0·10	0·11	0·12	0·14	0·14	0·14	0·15	0·15	0·15	0·16	0·18	0·19	0·21	0·22	0·22	0·22	0·22	0·22	0·23
VI.	2·4— 3·6	0·06	0·07	0·07	0·07	0·08	0·09	0·09	0·09	0·09	0·09	0·09	0·10	0·10	0·11	0·12	0·13	0·14	0·14	0·14	0·14	0·14
VII.	3·0— 2 9	0·04	0·05	0·05	0 05	0·05	0·06	0·06	0·06	0·06	0·06	0·06	0·07	0·07	0·08	0·08	0·09	0·09	0·09	0·09	0·09	0·09
VIII.	..	..	..	..	..	..	..	..	..	..	..	0·04	0·05	0·05	0·05	0·05	0·06	0·06	0·06	0·06	0·06	0·06
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0·04
	Total . . .	2·55	3·04	3·58	4·18	4·51	4·20	3·98	3·77	3·54	3·31	3·10	4·03	5·48	7·94	12·06	15·80	15·24	13·57	10·90	7·15	2·55

in character, but become correspondingly steeper, because the change causes greater differences to occur in the quantities of illumination falling upon individual receiving surfaces placed in similar positions along the street.

Fig. 5 shows that when the lamps are disposed centrally, the illumination falling upon a vertical surface also in the centre of the road increases as the lamp is approached, to a maximum about 15 feet distant; but it then falls sharply to the foot of the post, because that particular lamp no longer throws much (or any) light upon the road surface. If the lamps are suspended alternately over the right and left kerbs, and the receiving surfaces are in the centre of the carriage way, or *vice versa*, fig. 6 shows the illumination to vary in a similar manner, but the differences are not so wide. When the lamps are spaced alternately over the two kerbs and the receiving surfaces are all above one kerb, the effect of fig. 7 is produced. The illumination first increases slightly to the place where Lamp I. becomes ineffective; then drops somewhat; and afterwards rises to a maximum about 15 feet before Lamp II. is reached. The maximum is higher than that in the corresponding position of fig. 6, because in fig. 7, which is case (*d*), the more distant lamps throw light upon a surface at point "55" at a smaller angle with the normal than do the distant lamps in fig. 6, which represents case (*b*) or (*c*).

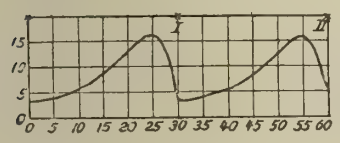


Fig. 5.

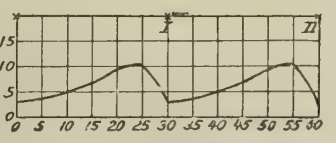


Fig. 6.

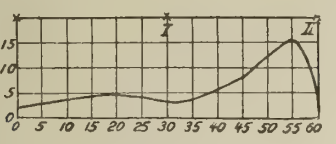


Fig. 7.

For the purpose of judging the degree of uniformity in the illumination, the relationships of the maximum and minimum illumination to the mean illumination have to be considered. To do this, it is necessary to ascertain the mean illumination by a process of integration over the whole illuminated surface, in the manner already adopted by Herr L. Bloch. This investigator has also used the arithmetical mean between the maximum and minimum illumination as the true mean illumination, which is manifestly not correct. However, in the case of street lighting, as the true mean illumination is unknown, and the spots of maximum and minimum illumination are so close together that the differences are quite conspicuous to the eye, the arithmetical mean may be taken. Hence we have—

	Maximum.	Minimum.	Arithmetical Mean.
Case (*a*)	15·56 ..	3·10 ..	5·02
,, (*b*)	10·23 ..	2·96 ..	3·79
,, (*c*)	10·23 ..	2·96 ..	3·79
,, (*d*)	15·74 ..	2·55 ..	6·17

The differences are largest in the last case; but a study of fig. 7 will show that for a distance exceeding half that investigated, the illumination is much more uniform in case (*d*) than in any of the others.

Comparative Results.

A comparison may now be made between the results of Dr. Krüss's calculations and Dr. Drehschmidt's measurements. The fact that the arc lamps in Leipzigerstrasse, Berlin, are 36 yards apart, instead of 33 yards as Dr. Krüss has supposed them to be, is not of great consequence. But on the other hand, as Dr. Drehschmidt made no measurements between a spot at the base of the lamp and one 34 feet off, the position of maximum illumination escaped him. In his first table (Table IV.),* Dr. Drehschmidt records the illumination falling upon a vertical surface in the centre of the carriage way placed at right angles to the direction of the road—the lamps being also in the centre of the road. He quotes the amount of light falling on both sides of each surface, terming all the sides which point in one direction the "right" sides, and those pointing in the opposite direction, the "left" sides. He then takes the average of the light falling upon the two sides of each surface, and calls it the mean illumination received by that surface.

* See "JOURNAL," Vol. XCVI., p. 465.

TABLE IV.—*Drehschmidt's Figures.*

Position of Surface.	Illumination Received by a Vertical Surface in the Centre of the Road.		
	Right.	Left.	Average.
33	1·25	2·05	1·63
22	5·51	3·18	4·34
17	3·47	4·39	3·93
11	2·28	6·81	4·54
0	1·34	1·60	1·47

This method of calculating the mean illumination falling upon each surface, however, cannot be correct, unless the surfaces are translucent. Actual objects in a road are opaque, and are rendered visible to a human eye by the light falling on one side of them only. Hence the proper way of manipulating the figures obtained by Dr. Drehschmidt is shown in the third, fourth, and fifth vertical columns of Table V., where, it will be seen, the "left-hand" figures are reversed in order. In Table V., therefore, the pairs of illumination values whence the several averages are extracted represent the amounts of illumination falling upon the opposite sides of those two (different) surfaces which occupy the same relative positions in respect of the lights when the road is regarded in opposite longitudinal directions.

TABLE V.

Position of Surface.		Illumination Received by Vertical Transverse Surfaces in the Centre of the Road.				
		Drehschmidt's Measurements.			Krüss Calculated.	Drehschmidt Reduced.
Drehschmidt.	Krüss.	Right.	Left.	Mean.		
0	0	1·34	2·05	1·69	3·10	3·39
11	10	2·28	3·18	2·73	5·51	5·48
17	15	3·47	4·39	3·93	8·02	7·89
22	20	5·51	6·80	6·16	12·23	12·35
33	30	1·25	1 60	1·42	3·10	2·85
		Totals		15·93	31·96	31·96

These pairs of right and left hand values ought theoretically to be equal in each case. The differences between them must be explained on the ground that the lamps were developing a different amount of light at the moment the illumination was measured in one direction from that which they were emitting when the measurement in the opposite direction was carried out. On comparing the totals at the base of Columns 5 and 6, it will be evident that the electric arc lights in Leipzigerstrasse, which are fitted with ground-glass globes, only emit about half as much light—viz., 1000-candle power—as is presumed to be the case in Dr. Krüss's calculations. The factor obtained by dividing the total of Column 6 by the total of Columns 3 and 4 is 2·01. If Dr. Drehschmidt's mean results in Column 5 are multiplied by this factor, so as to obtain a grand total equal to that given by Dr. Krüss's calculations, the last column of Table V. is obtained; and it will be found that the individual figures agree very closely, each to each.

Hence it must be concluded that the arc lamps employed in Leipzigerstrasse radiate their light very uniformly all round, and that any remaining inequality is eliminated by the obscured globes. On comparing, in a precisely similar fashion to that adopted in Table V., Dr. Drehschmidt's actual figures with Dr. Krüss's calculated values for transverse vertical surfaces situated over the footways, Table VI. is arrived at.

TABLE VI.

Position of Surface.		Illumination Received by Vertical Transverse Surfaces Situated over the Footpaths.				
		Dreschmidt's Measurements.			Krüss Calculated.	Dreschmidt Reduced.
Drehschmidt.	Krüss.	Right.	Left.	Mean.		
0	0	1·51	2·28	1·90	2·96	3·52
11	10	2·02	3·00	2·51	3·80	4·65
17	15	2·88	3·17	3·27	6·94	6·06
22	20	4·96	5·08	5·02	9·45	9·30
33	30	1·14	1·64	1·39	2·96	2·58
		Totals . . .		14·09	26·11	26·11

Here the factor required to render the total of Column 5 equal to the total of Column 6 is 1·85 instead of 2·01. Dr. Drehschmidt has thus found the illumination over the footways to be proportionately 9 per cent. higher—a difference presumably due to reflection from the house-fronts, which is a factor ignored by Dr. Krüss. The individual figures in the last two columns do not agree as well in Table VI. as in Table V. The reason for this is not clear, but perhaps reflection has something to do with it.

Most Advantageous Distribution.

It may now be interesting to consider, with the aid of the foregoing data, how the rays of light issuing from any source should be distributed over the various angles of a vertical plane if the illumination in a road is to be uniform at all points.* On referring to Table I., it will be seen that when both lamps and receiving surfaces are in the centre of a road, light falls upon the different receiving surfaces from Lamp I at all angles between 14° and 90°—*i.e.*, over an angular distance of 76°. From the other lamps, the corresponding angles are from 2·4° to 14°. But only Lamp II. throws sufficient light on the surfaces between points "0" and "30" to be worth attention.

TABLE VII.

—	Position of Receiving Surface.					
	0	5	10	15	20	25
Angle of emission from Lamp I. . . .	14·00	16·70	20·60	26·60	36·90	56·30
Illumination from Lamp I.	2·03	2·81	4·10	6·36	10·24	13·66
Reducing factor	1·00	0·67	0·41	0·23	0·11	0·05
Reduced illumination from Lamp I. .	2·03	1·88	1·69	1·44	1·11	0·64
Illumination from Lamps II.–VI. . .	1·07	1·22	1·41	1·66	1·99	2·64
Total illumination	3·10	3·10	3·10	3·10	3·10	3·10

Now, the amount of illumination falling upon the surfaces might be altered by changing the proportion of light radiated from the sources between the angles 0° and 14°; but it would not be advisable to do so. A reduction in the amount of light emitted within these angles would not be advantageous, because Lamp II. is already throwing a valuable quantity of illumination upon the surfaces by the time that position "29" is reached. An increase in the amount of light emitted within the same angles would not be advantageous, because, were it so increased, the effect of Lamp I. would have to be diminished more than is otherwise necessary. Thus in imagining the ideal lamp for street illumination, it is the rays emitted between the angles 14° and 90° that need correction to ensure uniformity. As a basis for the calculation, it is better to take the minimum value shown in Table I.—*i.e.*, 3·10 meterkerzen; for if either the maximum or the mean be selected, the ideal emission curve becomes hopelessly impossible.

* Dr. Krüss admits that this inquiry is as illusory as the endeavours now being made in England to design an ideal gas-retort in the lecture hall, without stopping to ask whether manufacturers would be able to construct the article when finally imagined.

On this basis, Table VII. is arrived at, where the item "Reduced Illumination from Lamp I." means the quantity of light which that lamp must throw upon the receiving surfaces at the different stated positions if the illumination at all positions is to be identical. The precise value for the uniform illumination—viz., 3·10 meterkerzen, has no significance at all beyond being the minimum afforded in the conditions already described. In Table VII. both lamps and receiving surfaces are supposed to be above the centre of the road.

The curve in fig. 8 is drawn from the figures given in Table VII., and shows that the ideal street-lamp must throw as little light as possible in a downward direction. Hence sources of light such as the flame arc are specially unsuitable for the purpose in view, as indeed experience has already proved to be the case. Reflectors which throw the light downwards are also to be avoided, and such are to be chosen as reinforce the light naturally emitted at small angles below the horizontal. An economical light of the kind indicated by fig. 8 is perhaps hardly to be produced; but it might possibly be imitated by placing round the light a system of Fresnel's lenticular rings, like those employed in lighthouses.

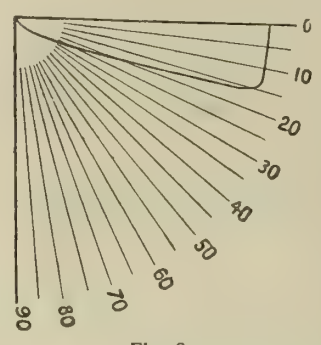


Fig. 8.

The work recently carried out by Dr. Drehschmidt shows that the Welsbach gas-light approaches more nearly to the curve in fig. 8 than the electric arc, for the former throws most of its light horizontally. The curve also explains why the illumination in Friedrichstrasse, Berlin (which is provided with Lucas lamps), has been found by Dr. Drehschmidt to be much more uniform than that prevailing under the electric arcs of Leipzigerstrasse. The newest types of Lucas lamp, examined by Herr Wedding, also approximate closely to the ideal curve.

TABLE VIII.

—	Position of Receiving Surface.					
	0	5	10	15	20	25
Angle of emission from Lamp I. .	13·80	16·30	19·80	24·90	32·70	43·80
Illumination from Lamp I. . . .	1·90	2·60	3·65	5·31	7·50	7·88
Reducing factor	1·00	0·66	0·56	0·28	0·15	00·8
Reduced illumination from Lamp I.	1·90	1·72	2·04	1·49	1·12	0·62
Illumination from Lamps II.-VI. .	1·06	1·20	1·40	1·63	1·95	2·35
Total illumination . . .	2·96	2 92	3·44	3·12	3·07	2 97

Table VIII. indicates the ideal distribution of light from lamps placed centrally over the carriage way, so as to ensure uniform illumination upon surfaces situated over the kerbs, or *vice versa;* and Table IX. similarly specifies the best distribution if the lamps are alternately over the two kerbs, and the receiving surfaces over one of them. As stated before, all these calculations are valid wherever the distance between two neighbouring lamps is four times the vertical distance of the lamps above the vertical receiving surfaces. If the lamps are the same distance apart, but are less highly elevated, the illumination is less uniform, because the angles of incidence in all positions of the receiving surfaces are wider, and therefore the illuminating power is greater. As the surface nears the lamp, the illumination received increases by virtue of the diminished distance, but decreases by virtue of the narrower angle of incidence; and if the latter effect is less powerful than the former, the illumination becomes less uniform.

TABLE IX.

—	Position of Receiving Surface.											
	0	5	10	15	20	25	30	35	40	45	50	55
Angle of emission from Lamp I. . . .	13·10	15·10	17·80	21·10	25·40	30·60	..	..	..	..	..	..
Illumination from Lamp I.	1·45	1·78	2·16	2·49	2·50	1·70	..	..	..	..	..	..
Reducing factor	1·00	0·78	0·60	0·39	0·28	0·17	..	..	..	..	..	..
Angle of emission from Lamp II. . . .	7·10	7·80	8·20	9·50	10·60	12·10	14·00	16·70	20·60	26·60	36·90	56·30
Illumination from Lamp II.	0·54	0·64	0·77	0·95	1·19	1·56	2·03	2·81	4·10	6·36	10·24	13·66
Reducing factor	1·00	1·00	1·00	1·00	1·00	1·00	1·00	0·67	0·41	0·23	0·10	0·05
Reduced illumination from Lamp I. . .	1·45	1·39	1·30	0·97	0·70	0·29	..	..	..	..	..	..
,, ,, ,, ,, II. . . .	0·54	0·64	0·77	0·95	1·19	1·56	2·03	1·88	1·68	1·46	1·02	0·68
Illumination from Lamps III.-VII. . . .	0·56	0·62	0·65	0·74	0·82	0·94	0·97	1 22	1·38	1·58	1·82	2·14
Total Illumination	2·55	2·65	2·72	2·66	2·71	2·79	3·10	3·10	3·06	3·04	2·84	2·82

RUBBER PACKING FOR JOINTS IN MAINS.

As recently reported in the "Journal für Gasbeleuchtung," a paper was read by Herr Burgemeister, of Celle, on the above-mentioned subject before the last meeting of the Association of Gas and Water Engineers of Lower Saxony.

The author began his remarks by admitting that in certain circumstances wrought iron or Mannesmann pipes were preferable to cast iron; but since cast iron undoubtedly lasted longer when buried in earth, it seemed a mistake not to use that material as often as possible, more particularly so because fractures could be avoided by making the joints in a proper manner, unless the ground were excessively treacherous. Herr Burgemeister stated that he had used nothing but cast iron during the 36 years he had managed the Celle Gas-Works, and had never experienced a single fracture. A short time ago, opportunities had arisen for inspecting some of the cast-iron pipes laid, without any preservative coating, 50 years ago. They exhibited no signs of corrosion, and only a few spots of rust; and they were evidently capable of lasting another 50 or 100 years, and were used over again, except in places where the growth of the district necessitated larger pipes being laid. These pipes, too, were cast horizontally, and therefore varied in thickness from 2 or 5 millimetres on one side to 15 millimetres on the other.



Fig. 1.

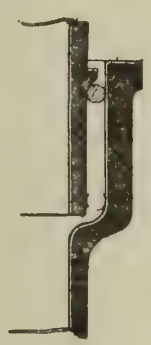


Fig. 2.





Fig. 3.



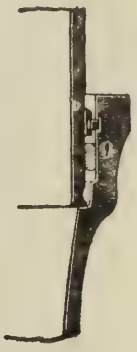


Fig. 5.

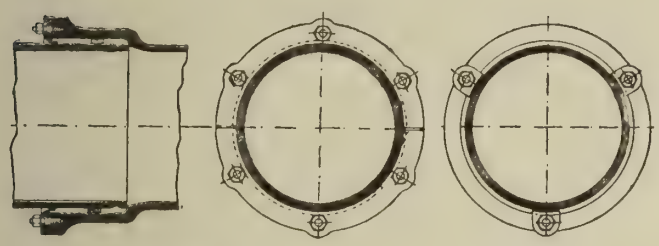


Fig. 4.

Fig. 6.

According to the author, rubber rings were first used for gas-mains at Worcester in 1847; the type of joint employed being that shown in fig. 1. They behaved excellently. In 1860, Herr Ziegler described a joint shown in fig. 2, which, during a lifetime of ten years, had only allowed leakage to occur at the rate of 3·17 per cent. per annum. The second design was an improvement on the first, because the absence of the collar cast at the extremity of the spigot rendered the joint more flexible. The rubber washers, however, were often insufficiently thick; they should be of such size as to be compressed to nearly half their natural thickness when in position. Joints made in this manner had never become popular in North and Central Germany, perhaps because unsatisfactory results had followed the employment of inferior rubber. In South Germany, many distributing systems were provided with them. All the joints on the Hanau gas-main up to 6 inches in diameter were of the pattern shown in fig. 2. In 1885, the author laid a small water-main for the town of Enzweiler, near Birkenfeld, with rubber-jointed cast-iron pipes, which was still in good condition. A few months ago, tests were carried out at the Friedrich Wilhelm works at Mülheim on various types of rubber joints. Two 13-feet lengths of 12-inch pipe, joined in the manner shown in fig. 3, were put under a water pressure of three atmospheres, and were safely bent through a distance of 6·7 inches from the straight without leaking. Four similar lengths were bent through a distance of 9 inches. These tests seemed to show sufficient flexibility even for employment in the shifting soil of Westphalia and Silesia.

Another joint recently brought out by the same firm, and mentioned by the speaker, is shown in fig. 4. A flange is screwed on to the end of the socket, and bears against a counter flange, rectangular in section, cast on the spigot in the proper position. Thus the rubber ring is completely enclosed. A different arrangement is represented in fig. 5. Two metal rings are slipped on the spigot, the first having a bevelled edge pointing towards the socket pipe, and being preferably made of bronze. When the pipes are connected up, and the bevelled ring is driven forwards, it forces its neighbour into a recess cast in the socket. Thus the joint is capable of expansion and bending; but it would probably not bear taking apart, and would perhaps be too expensive to use. In the author's opinion, a perfectly satisfactory rubber joint can be cheaply constructed by slightly modifying figs. 1 or 2 and 4. A simple ring should be bolted by three studs, as shown in fig. 6, on to the face of the socket, so that its inner edge may bear against the collar on the spigot shown in fig. 2; and the collar should be made so much thicker that a space of only about 2 or 3 mm. is left between its periphery and the inner surface of the socket. This arrangement gives sufficient lateral and longitudinal play, while the ring prevents the pipes being forced apart by the pressure (of the water) within them.

It is most important, Herr Burgemeister added, that all the washers should be made of the best quality Para rubber, as inferior grades quickly perish; and they should be a trifle large rather than the least degree small. High compression of the rings is, of course, more necessary in the case of pipes delivering water than in that of gas-mains. Washers of good rubber which had remained in service for 15 or 17 years were exhibited to the meeting, and would have been used again by the speaker if he had not been compelled to lay pipes of larger diameter.

Herr Burgemeister concluded with the statement that he had never discovered a rubber jointed socket joint to become leaky in all his thirty years' experience, though numerous joints made with lead had failed, and some of the pipe lengths had broken.

Progress of De Brouwer Stoking Machinery.

Messrs. W. J. Jenkins and Co., Limited, of Retford, have received from the Derby Gas Company, through Mr. J. Ferguson Bell, M.Inst.C.E., their Engineer, an order to fit up a large retort-house at their Litchurch works with the most improved De Brouwer coal-projector and with "Jenkins De Brouwer" pusher discharging machines. For economy of working in summer, they have ordered one of Jenkins's complete stokers, whereby the whole work of charging and discharging the retorts will be done by one man working one machine. The order includes the supply of gas-engine driven electric generators in duplicate; the engines being of sufficient power to drive the dynamos and the whole of the necessary waggon-tipping and coal and coke handling plant. The last-named plant completes the retort-house, which has for some years been partly fitted with De Brouwer coke-conveyors and storage hoppers. This large extension of the use of the "D. B." projector and pusher is peculiarly gratifying to the Contractors, as it will no doubt be remembered that Mr. Bell was the first gas engineer in this country to give the new machines a trial. Messrs. Jenkins also inform us that they have in hand at the present time a large order for stage floors, retort-bench fittings and mains, coal and coke handling plants, and stoking machinery for the Christchurch (New Zealand) Gas Company, stoking machinery and generating plant for the Metropolitan Gas Company of Melbourne, coal-handling plant and stoking machinery for the Lincoln Corporation, and stoking machinery for the Southampton Gas Company; and they have just started an installation of stoking machinery at Montreal. In connection with the preceding particulars of the extension of the "D. B." plant, it may not be uninteresting to give the following record of progress since the introduction of the projector and pusher in 1903.

	Projectors.	Pushers.
Great Britain	42	24
New Zealand	2	2
Australia	1	1
Canada	1	1
Buenos Ayres	1	—
(By Messrs. W. J. Jenkins and Co., Limited.)		
Germany	22	4
France	22	19
Belgium	6	6
Italy	2	2
America	4	4
Holland	6	6
Spain	3	2
Switzerland	1	1

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the North Middlesex Gas Company's Works.

Last Saturday afternoon, the members of the London and Southern District Junior Gas Association—to the number of about 35—headed by the President, Mr. W. Upton, paid a visit of inspection to the works of the North Middlesex Gas Company, at Mill Hill. Unfortunately, Mr. L. Trewby, the Company's Engineer and General Manager, was unable to be present to receive the party; but the visitors were met on their arrival by Messrs. P. J. Colman, J. R. Gale, and S. A. Carpenter, who then proceeded to show them round the works and explain the various points of interest. In addition to this, Mr. Trewby had thoughtfully had the main features set forth in a little booklet, which was of great assistance to the members in their inspection. The time at disposal, however, proved all too short; for when the party sat down to tea (to which they had been kindly invited), there were still some portions of the works—the purifiers, for instance—which had not been visited. But the best possible use had been made of the afternoon; and when darkness had quite set in, the members left, well pleased both with what they had seen and at their cordial reception.

The North Middlesex Gas Company serve a large area, the districts supplied comprising Mill Hill, Hendon, Church End Finchley, part of North Finchley, and East Finchley; and though building has been, and is still, going on very rapidly, there yet remains ample room for further development of the neighbourhood. The consumption of gas has been steadily increasing; and the quantity sold last year amounted to 156 million cubic feet. The charge to ordinary consumers is 3s. 8d. per 1000 cubic feet, and to prepayment meter users 4s. 4½d.—that is 19 feet for 1d. The works are close to Mill Hill Station of the Great Northern Railway; and the Company have a siding, from which the coal-trucks are drawn into the store (alongside the retort-house) on overhead rails by means of hydraulic capstans. The retort-house contains six beds of seven through retorts 22 in. by 16 in. and 20 feet long; and the house is at present being extended, in order that three more similar beds may be put down. The furnaces are direct-fired; and in the extensions now in progress this system will be adhered to, because of its advantages of easy attention and relatively low initial cost. The make of gas per mouthpiece is from 5500 to 6000 cubic feet, and per ton 11,500 cubic feet; while the fuel consumption is 20 per cent.

On leaving the retort-house, considerable interest was evinced in a water-softening plant, which has been fitted up over the boilers. This was erected by Messrs. Mather and Platt, and is the Archbutt-Deeley process—the water being treated with 1¾ lbs. of lime and 7 oz. of alkali per 1000 gallons. There are three boilers; the largest of which is fitted with Lee, Howl, and Co.'s forced-draught apparatus, and the other two with Meldrum's. The two exhausters—passing 60,000 and 30,000 cubic feet per hour respectively—are by Messrs. George Waller and Son. There are installed two of Messrs. Humphreys and Glasgow's 250,000 cubic feet per day carburetted water-gas plants; and at the present time the coal gas and water gas are exhausted and purified together. This arrangement is not, however, found to be a satisfactory one; and consequently steps are being taken to put down two more exhausters this summer. When this has been done, the coal gas will be purified separately from the water gas, and the two will be mixed at the inlet of the holder. The carburetted water-gas engine-room contains two turbine blowers, a hydraulic engine for working the capstans already referred to, and scrubber, oil, and condenser pumps for the water-gas plant. The accumulator for the capstans throws a pressure of 800 lbs. per square inch. In the other engine-room, there are two turbine pressure-raisers, having a capacity of 120,000 cubic feet per hour. These turbines have been installed in order to save the expense of laying a larger main to supply the East Finchley district; and they work on a 10-inch main at a pressure of 10 inches, from dusk till 10 p.m. The main is not tapped until East Finchley has been reached, which is about 3½ miles away; and then, by the friction in the main, the pressure of the gas is reduced to 3½ to 4 inches. By the side of the turbines, there is a small blowing apparatus originally used for the purpose they now fulfil; and this is employed to run the gas from the small holder to the large one.

There is a pump-house, in which are the liquor and tar pumps; and an overhead tank contains the waste water from the works, which is used for quenching coke. In addition to the tar separating and cooling tank, there are two oil-tanks, of a capacity of 8460 and 12,972 gallons respectively. In the water-gas meter-house, there are two station-meters—one of 30,000 cubic feet capacity in use, the other of 15,000 feet in reserve. The coal-gas meter house is provided with a meter having a capacity of 60,000 cubic feet. The two tower scrubbers are 55 feet high, and filled with boards; while each has a tar-extractor at the bottom. An old tower scrubber on the works is now used for extracting water from the water-gas tar. It has a steam-coil inside; and by means of the heat, and also through the weight of the tar, the quantity of water has been got down to 1 per cent. The stores, which are excellently arranged, contain everything required on the district and works. Each fitter has a separate bin; and he brings in his orders at night, and finds what he requires placed ready for him in the morning. In the governor-house, there are two governors—one an 18-inch, and the other an 8-inch; the latter being used in connection with the pressure-raisers. With regard to the purifiers, the covers on one set are held down by Paddon's patent arrangement; while the second set are luteless. Oxide of iron only is now used for purification. There are three holders, the capacities of which are 61,600 cubic feet, 234,000 feet, and 454,000 feet; the smallest being used solely as a relief holders for the water gas. Other departments on the works are a machine shop (at present incomplete), fitters' shop, stove shop and carpenters' shop, and stables, &c. Over the general offices, laboratory, and photometer-room, are the private offices. Care for the comfort of the employees is seen in a well-appointed lavatory, fitted with bathing accommodation, a mess-room, and a further large room to be used for reading and recreation.

It was in the latter that tea was served, at the conclusion of which the President proposed a very hearty vote of thanks to the Company for having placed their works at the disposal of the Association, and to the members of the staff who had shown them round and explained everything. He remarked that it was in a small works like these that one could get the best grasp of the whole of the operations that were necessary to the production of gas to-day. He thought that it was in the smaller works that the greatest facilities existed for experiments, and for the carrying out of any individual ideas that the manager might possess. Experiments were absolutely necessary. The industry was now in a very favourable position; but they could not afford to rest upon their oars, and say there was no prospect of improving the existing apparatus. Their opponents had some clever men among them; and therefore no matter to what pitch they had got the production of gas, they must continue to move forward. The works they had gone over that day were very nicely arranged; and those who were responsible for the carrying on of them would have plenty to occupy their attention, for it was a growing district. The members were greatly indebted to the Company and the officials for the courtesy extended to them; and he was only sorry that Mr. Trewby had to be away. The vote was seconded by Mr. W. J. Liberty, who said it was a very great thing to see gas going ahead as was the case at these works.

Mr. Gale, in acknowledging the vote (which was carried by acclamation), pointed out that the Company had a large area, and very few houses on portions of it. The price of gas was certainly not high, when one considered the area and the number of consumers. He was, for three reasons, pleased to say they had electricity at Finchley. The first reason was that it created competition, which was a good thing; secondly, people could not say that gas had a monopoly; and, thirdly, a comparison of the lights was a very good advertisement for gas. The saying that "Comparisons are odious" must have originated with an electrician. He was sure that Mr. Trewby would be pleased to see the members of the Association at any other time they might like to visit the works. The place was at present somewhat in a state of chaos; but if they returned in (say) a couple of years, they would find everything in "apple-pie" order.

Society of Engineers.

The first ordinary meeting of the Society for the present year was held on Monday evening, Feb. 3, at the Royal United Service Institution, Whitehall. Mr. Maurice Wilson, the President for 1906, occupied the chair at the opening of the proceedings, and presented the premiums awarded for papers read during the year; among them being a premium of books to Dr. David Sommerville, for his paper on "The Chemistry and Bacteriology of Potable Waters." The thanks of the Society were accorded to several gentlemen, among them being Mr. Perry F. Nursey, the Secretary, for papers presented by them. Mr. Wilson then introduced the President for the current year, Mr. Richard St. George Moore, and vacated the chair, receiving a hearty and unanimous vote of thanks for his services. The President then proceeded to deliver his Inaugural Address, which was a thoughtful consideration of the *status* of professional or consultant engineers, with suggestions for its improvement. He divided under two heads the points he suggested as being worthy of attention—viz., (1) Those which apply to the profession and to the public, and control them equally, therefore requiring legislation; and (2) those which apply only to the internal regulation of the profession. The most important point raised under the first head was: Would it be wise and advisable for engineers to have a legal standard of qualification before they can be entrusted with the expenditure of public moneys or with works where the public safety is concerned? In arguing in favour of some form of control, the President pointed out that in both France and Germany the control of the expenditure and the public safety is only entrusted to engineers of very specific acquirements. The address was listened to with marked attention by a large and appreciative audience; and at its close a hearty vote of thanks was accorded to the President.

The Midland Junior Gas Engineering Association will hold their second annual general meeting on Saturday, the 2nd prox. After the presentation of the Council's report and balance-sheet, the election of officers for next session, and the filling of vacancies on the Council, Mr. W. Wastell will read a paper entitled "Gas-Works Statistics."

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to Glass Houghton and Castleford Collieries.

A large number of the members of the Association assembled on Saturday at Pontefract, to visit the pits and surface works of the Glass Houghton and Castleford Collieries, Limited. Several of the West Riding gas engineers accompanied them, and the party was joined at the station by the Mayor (Alderman Granidge), Councillor Stuart Lowden, Mr. J. E. Pickard, the Borough Surveyor, and Mr. S. B. Bagley, of Messrs. Bagley and Co., bottle manufacturers, of Knottingley, the largest local customers of the colliery. The visitors were conveyed to the neighbourhood of the pits in special tramcars which were in readiness; and no labour and forethought had been spared to ensure the general comfort and instruction of the members. The visit had been secured by the good offices of Mr. L. V. Whitaker, Manager of the Pontefract Gas Company, who is one of the members of the Association; and, in conjunction with the officials of the colliery, he carried out all the arrangements.

After having made the necessary alterations to their dress and been provided with lamps, the visitors assembled in the workshops, where under one roof, in a building 162 feet by 40 feet, the carpenters, fitters, blacksmiths, &c., do their work. Here Mr. John Parkin, the General Manager, bade the members a hearty welcome, briefly sketched the afternoon's arrangements, and then handed the party over to the guidance of Mr. Charles Parkin, Mr. B. Burton, Mr. J. O. Cooper, and other members of his staff. The various local visitors joined the party in loyally doing the full circuit of the underground workings marked out to be visited.

The colliery is on the extreme east of the West Riding coalfield as at present worked, and is therefore of considerable depth. Three pits have been sunk to the Haigh Moor, the Silkstone, and the Beeston seams—these being respectively 347, 550, and 637 yards deep; while a fourth is being sunk from the Silkstone to the Beeston seam. The 550 yards pit was the one descended, as it is at present the most important one—yielding from 2000 to 2300 tons of coal per day; and as the seam is a 5-feet one, the workings very dry, and the roads free from dust, it presented the minimum of inconvenience to the visitors. The seam nearest the surface is now nearly exhausted, and yields but about 200 tons of coal per day; while the workings are more than a mile-and-a-half from the bottom of the shaft. The lowest seam is not yet fully opened out; but when the necessary works in connection with it are completed, it is expected to give a daily output of another 2000 tons. The cages have each four decks, each deck accommodating three corves holding 11 to 12 cwt. each. Both at the surface and at the bottom of the pit, the corves are put on and taken from the cages at two levels simultaneously.

As few if any of the members present were unacquainted with the ordinary details of coal mining, the great attraction was recognized to be the exceptionally complete installation of labour-saving devices; and as the management had, with great kindness, arranged that everything should be shown in operation, even having a number of hewers at work and a pony attached to some corves, close attention was paid to the details, and especially the mechanical devices. In the pit visited all the underground power is compressed air, with the exception of one section, where the haulage is operated by electricity. Two 16-inch cylinder engines, worked by compressed air, are used for hauling the corves by endless rope along the main roads. The coal is conveyed from the working faces along band conveyors, which feed on to plate-belt conveyors, and these in their turn discharge into the corves. This pit, though but a very recent one, and with no distant workings, has now 660 yards face of these conveyors. The conveyors were not only seen in movement, but actually carrying coal just hewn. The members were, of course, familiar with such conveyors in gas-works; but their utilization under such novel and severe conditions (of which this was an early installation) was well worth a special visit. Much interest was aroused in the ease with which huge pieces of coal were transported; and the great advantages of the band conveyor in speed and in the amount it can handle in a given time, were plainly seen.

Returning to the surface, the sources of the power production were visited. Steam is supplied by sixteen Lancashire boilers, 30 feet long. Eleven are new, and have a working pressure of 120 lbs. per square inch; while the other five work at 60 lbs. pressure. All their feed-water is superheated by the exhaust steam from the various engines. The winding-engines have 44-inch cylinders and 7-feet stroke; while the winding-drum is 20 feet in diameter. The air-compressing plant consists of two sets of two-stage compressors. The low-pressure air cylinder is 30 inches in diameter, from which, after cooling, the air is delivered to a high-pressure cylinder of 22 inches diameter, working at 60 lbs. per square inch. Room is left for doubling this plant soon. These compressors work continuously night and day; doing the underground haulage in the two seams now worked, and driving the conveyors during the day shift and the coal-cutters during the night shift. Similarly, the electric plant runs continuously, one 50-kilowatt dynamo driving one section of the underground haulage in the silkstone seam during the day shift, and the coal-cutting in the top seam during the night shift. Another dynamo supplies the electric lighting. As several of the members are connected with works where compressed air is used for West's chargers, and as most of those present had seen the system in use in gas-works, this compressing plant was examined with something of professional eagerness and keenness.

The ventilation is produced by a self-contained "Waddel" fan, 25 feet in diameter, capable of discharging 300,000 cubic feet of air per minute. The construction of this fan was carefully explained; and the advantages of the unusual incidence of its centre of gravity were pointed out. A new "Walker" fan, of equal capacity, was in course of erection, and was thus open to more easy inspection. The electric power and lighting dynamos, air-compressors, and gas-engines for driving the second fan are all under one roof, and so need but one attendant on each shift. There are 30 coke-ovens, very much after the old beehive type, with the necessary crushing and elevating plant. The screening-plant at the head of the silkstone seam pit was seen in full operation; and the whole process, from the arrival of the coal at the mouth of the shaft to its various destinations in waggons, &c., was duly followed. It is claimed that this plant is one of the most complete and efficient in the country; and being capable of dealing with from 2500 to 3000 tons per day, it is well ahead of any claims that may be made on it. The output of the collieries is approximately 600,000 tons per annum; and a total of about 1700 persons find employment above and below ground.

On their return to Pontefract, the members were entertained at dinner at the Queen's Hotel by the proprietors of the colliery. The Corporation and other official visitors were present, and the Mayor occupied the chair. After the usual loyal toasts had been honoured, Mr. John Parkin, the General Manager, proposed "The Gas Industry and its Associations." After references to Murdoch and his experiences and work, he dealt with the importance of the gas industry as regards the capital invested in it, and showed how important a share of the total coal output of the country it utilized. He thanked the members for their visit, and assured them of the pleasure it had given the management to arrange for their coming. He bore testimony to the willing co-operation of his assistants; and expressed the hope that all present had enjoyed and profited by their visit. Mr. J. W. Turner, the Engineer and Manager of the Mirfield Gas Company, responded. Mr. W. Cranfield proposed "Success to the Glass Houghton and Castleford Collieries, Limited," and voiced the thanks of the members for the benefits, intellectual and material, which had been so generously provided for them. Mr. B. Burton responded on behalf of the Company. Mr. H. Butterfield, the Junior Vice-President, proposed "The Mayor and Corporation of Pontefract." The genial Mayor has had a lifelong interest in gas companies, on the directorate of several of which he has served; and in the Pontefract Gas Company he is just now peculiarly concerned, inasmuch as he is both a large shareholder and the official head of the Corporation, who, as our readers are aware, have lately obtained powers for the purchase of the Company's undertaking. His speech in reply to the toast of his health was racy, and abounded in reminiscences of his experiences in gas matters; and it most suitably wound up an afternoon and evening that will long linger in the memories of those who were present.

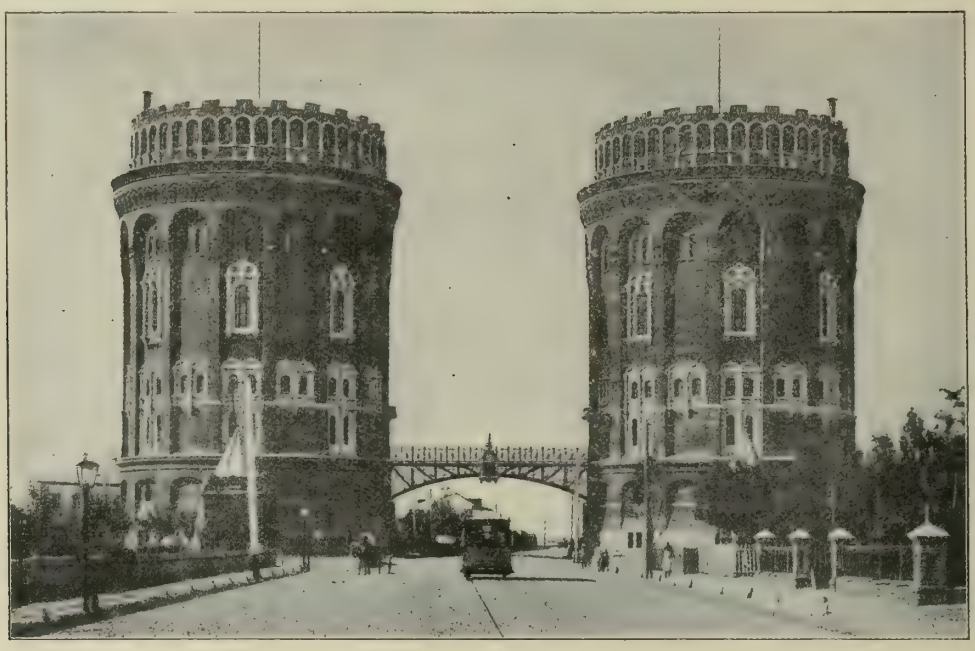
Society of British Gas Industries.

The arrangements for the annual general meeting of this Society have been made. The meeting place will be the Holborn Restaurant; and Wednesday, Feb. 27, the date. There will be a business gathering of members at 3.30; and at 5 o'clock the President (Mr. Dugald Clerk) will deliver his presidential address. The topic he has chosen is "Some Possible Improvements in British Patent Law;" and in view of the proposed amendments that the President of the Board of Trade has in hand for the consideration of Parliament this session, Mr. Dugald Clerk's address will come very opportunely. Perhaps Mr. Lloyd-George might do worse than wait till after the meeting before divulging the nature of his amendments, as if there is anyone able to give him a lead in connection with patent law, that one is Mr. Dugald Clerk. In the commercial life in which the members of the Society move, the Prevention of Corruption Act, 1906, is of great importance, for the measure is as much to prevent unfair advantage being taken of, or injury done to, the manufacturer and contractor by unscrupulous persons, as it is to guard officials and others from insults and temptations, and to prevent their corruption. Therefore the exposition of the Act that Mr. C. E. Brackenbury, Barrister-at-Law, is to give will furnish an excellent second part to the meeting. There will be an informal dinner of members and friends in the evening.

The Proposed Engineering and Machinery Exhibition.—We learn from the prospectus of this exhibition, which is being organized by Messrs. Smith and Bridges, to be held at Olympia from Sept. 19 to Oct. 19 next, that sections will be devoted to gas, steam, and oil engines, water-works engineering, and chemical plant. In the list of patrons of the exhibition are the names of Mr. Charles Hunt and Mr. W. B. Bryan, the Presidents respectively of the Institution of Gas Engineers and the Junior Institution of Engineers. As already mentioned, the Secretary of these Institutions (Mr. Walter T. Dunn) is upon the Advisory Committee, other members of which are Mr. Dugald Clerk, Mr. J. W. Helps, and Mr. D. Irving. The President is Sir Alexander B. W. Kennedy, F.R.S., the President of the Institution of Civil Engineers.

TWIN WATER-TOWERS AT MOSCOW.

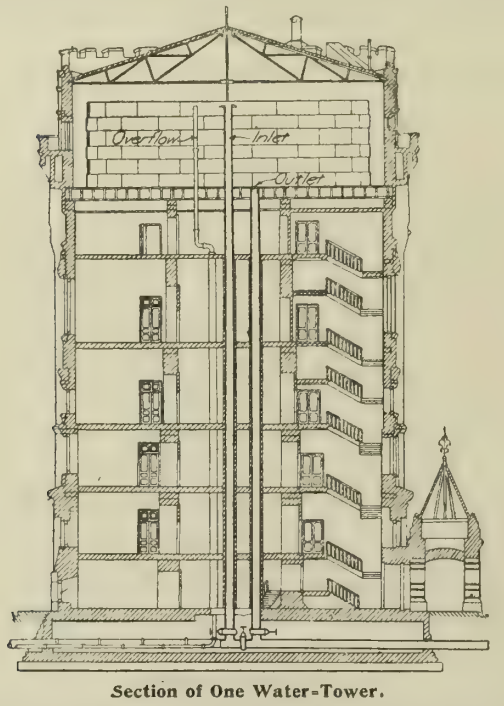
Moscow, the ancient capital of Russia, has now a population of about a million; and its water-works have a capacity of some 20 gallons per head. The works are owned by the Municipality, who sell water to consumers at a uniform rate of about 10d. per 1000 gallons. There are two separate water-works systems, both containing many interesting features, which are described in a report by Mr. N. P. Simin, formerly Chief Engineer of the Water Department. The following notes, extracted from the report, appeared in a recent number of "Engineering Record."



The Krestovsky Twin-Towers of the Moscow Water-Works.

The central part of the city receives ground water from Mitishy, while the surrounding districts are supplied with filtered river water, taken from the Moscow River at Roublevo. Both sources are situated about 10 miles from the city. Each of the two distributing systems receives its water from elevated reservoirs placed at the entrance of the mains supplying the city. The 36-inch main for river water, with a second parallel 36-inch main now being laid, reaches the city on its southern side, and there discharges into a reservoir placed at the highest point of the Sparrow Hills.

The two ground-water mains, 30 inches and 24 inches in diameter respectively, enter the city on the north. There being no hills on that side of the city, the Krestovsky twin water-towers



Section of One Water-Tower.

were built to support the tanks which serve as reservoirs. These are placed at the same level as the Sparrow Hills reservoir, so that the two water supplies may be connected if necessary. The Mitishy ground water supply delivers into the twin towers about 10 million gallons per day. The water is drawn from sixteen driven wells, 20 inches diameter; special centrifugal pumps being used for the purpose. These pumps are sunk 50 feet deep in each of the 20-inch well casings, and are driven by three-phase motors at the ground level, connected directly with the vertical shaft of the pumps. The water is pumped first to the Alexeievsky distributing reservoir, having a capacity of 3½ million gallons, and then to the elevated tanks in the twin towers.

The tank of each tower has a capacity of 500,000 gallons; being 60 feet in diameter and 20 feet deep. The top is 116 feet above the surface of the ground, which ensures a pressure in the pipe system nowhere less than about 30 lbs. The total height of the towers is 129 ft. 6 in. They are of a cylindrical shape 82 feet in diameter, built of brick masonry laid in portland cement. The foundations are 14 feet deep, and rest on sand. Each consists of a layer of concrete 2 ft. 6 in. thick, over which 11 ft. 6 in of brick masonry in circular and radial walls is placed. The bottom plate of each tank is $\frac{5}{8}$ inch thick, and the cylindrical walls are $\frac{1}{4}$ inch and $\frac{1}{2}$ inch thick. The weight of each tank is 80 tons; that of the water it contains is 2000 tons; and the total weight of each tower, with the reservoir filled with water, equals 14,000 tons. The two towers are identical in construction, and symmetrical; they are connected by an iron bridge at the height of the third storey. There are six floors below the bottom of the tank, as shown in the accompanying illustration. All the apartments in the towers are utilized for different purposes of the water-works administration. Each tower has its central steam heating-system. The total cost of construction of both towers, including the tanks and piping, was about £90,000.

When the towers were ready for use, two very interesting facts were observed. In the first place, expansion cracks showed themselves in the walls of the towers as soon as the heating of the interior rooms began in winter. These cracks appeared in both towers quite symmetrically in places where the furnace of the central heating system passed near the walls. An accurate examination showed that there was no change in the positions of the foundations. Precise registrations of the periodical widening and contraction of the cracks were made by special instruments during two years; and they showed that the cracks opened to the maximum of 1 inch in the coldest days of winter, when the difference between the inside and outside temperatures reached its maximum. In summer, when the heating system was not used, the cracks closed almost entirely. Investigation led to the conclusion that they were inevitable.

The circular wall of each tower is about 225 feet in circumference, and from 3 to 6 feet thick. The difference between the inside and the outside temperatures in winter is about 40° C. (104° Fahr.). This tends to make the outside of the wall shorter and the inside longer by about 1 inch. This change of length would correspond to a stress of (say) 180 lbs. per square inch, which exceeds the strength of brick masonry. The radial walls in the towers have the effect of increasing the thermic strains of the outside walls. The appearance of thermic cracks in the walls could have been avoided only by the use of expansion joints.

The other matter deserving attention was an unusual accident to the pipe system in one of the towers. The pipe supplying the tank enters it at the top, while the discharge-pipe is led off from the bottom. At a time when the reservoir remained about half filled for several hours, an eddy formed over the outlet-pipe, into which air was thus drawn. The air accumulated behind a half-closed valve on the 24-inch main leading to the distributing system. When this valve was fully opened, the liberation of the air caused a severe water-hammer shock, which ejected from the pipe a stream of water with sufficient force to break through the roof of the tower, the air pocket acting in much the same way as do those in air lift-pumps.

REGISTER OF PATENTS.

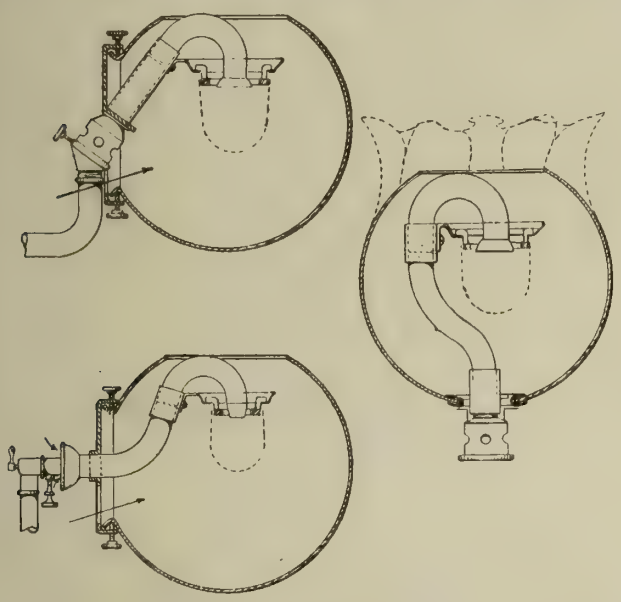
Inverted-Mantle Incandescent Gas-Lamps.

STEINICKE, G., of Berlin.

No. 1848; Jan. 24, 1906.

This inventor uses a detachable mixing-tube which ascends within the globe, and has, at its upper end, a downwardly bent portion to which the mantle is fitted. Three forms of the lamp are shown.

In the first form, the gas enters laterally, and to the inlet pipe is fitted an inclined nozzle having an adjusting screw. The lateral aperture in the globe is provided with a metal disc (preferably perforated), leaving the lower part of the lateral aperture open for the passage of air. The disc has an inclined downwardly directed edge or flange provided with a circular aperture into which is fixed a tubular socket,



Steinicke's Inverted Mantle Lamps

which serves for the reception of the upwardly directed mixing-tube, and thus allows of mounting the globe and fittings on the mixing-tube. Into the upper end of the socket is inserted one end of a bent pipe which forms a continuation of the mixing-tube, and to which the mantle and support are attached.

In the second form, a horizontally directed pipe is connected to the gas supply-pipe and passed through a lateral aperture in the globe. This lateral aperture is closed by a metal plate having at its lower part an aperture for the entrance of air. The regulation of the gas supply to the nozzle is made by the tap or screw at the side.

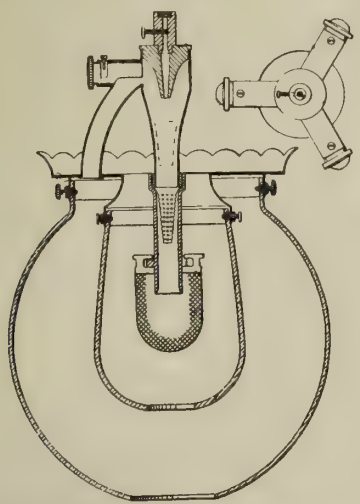
In the third construction, the gas supply is from the bottom through a nozzle and pipe coupling. To the latter is connected a downwardly bent pipe and support for the mantle.

Inverted Incandescent Gas-Lamps.

PRICE, C. W., of Holloway, and SPREADBURY, E. L., of Kettering.

No. 2369; Jan. 30, 1906.

According to this invention, the air which mixes with the gas in the bunsen burner is heated by being passed through tubes which are heated by the combustion in the mantle. The supply of gas to the burner is regulated independently of the ordinary tap; and the air supply is also capable of being regulated independently of the gas



Price and Spreadbury's Inverted Gas-Burners.

supply. The burner can thus be adjusted so as to obtain the required pressure of gas and air notwithstanding that it is used with different gas pressures. To improve the admixture of the gas and air in the mixing-tube of the burner and reduce liability to back-firing, the gas and air are caused to pass through contracted passages on their way to the mantle; the arrangement being such that the gas and air are afterwards allowed to expand by fitting in the mixing-tube one or more hollow truncated cones, the smaller end of each being downwardly directed.

In the construction of lamp shown, the gas inlet is controlled by a set-screw extending into the gas-passage. The mixing-tube projects through a central opening in a cover or plate that carries a depending glass globe having a suitable air inlet and adapted to enclose the mantle. The globe is so supported that its upper edge makes a practically tight joint with the cover or plate. Extending upwardly from the plate or cover are a number of air-tubes, which connect the space within the globe with the mixing-chamber of the burner near the gas-jet. These tubes (either parallel or decreasing in cross sectional area towards the upper ends) are inclined inwardly and connected to short horizontal tubes that lead to the mixing-chamber. They are fitted with hollow screwed plugs, each closed at its outer end and having a side aperture corresponding in size to the top of the inclined air-tube, so that, by turning the plug slightly, the supply of air can be regulated.

From the underside of the plate around the central aperture there depends a funnel-shape flange or tube of such size and extending far enough down to ensure that the products of combustion will pass up through it, around the mixing-tube of the burner, and pass out through the central opening in the cover or plate. This will also heat the inclined air-tubes, and facilitate the circulation of air from the globe through the air-tubes into the mixing-tube of the burner, and so increase the proportion of air to gas flowing through the mixing-tube. With such an arrangement "the air will be highly heated before mixing with the gas, and the mixture will be extremely hot by the time it reaches the mantle."

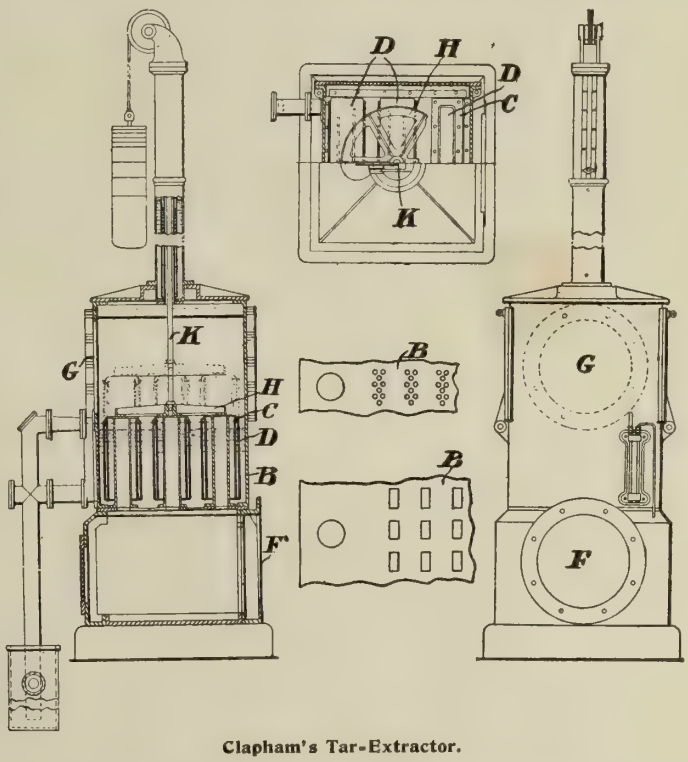
Extracting Tarry Matter from Gases.

CLAPHAM, S. B. & T. A., of Keighley.

No. 3809; Feb. 16, 1906.

This apparatus is of the kind wherein perforated plates are employed for the gases to pass through and impinge upon; and the invention consists in an "improved formation," so that, "without increasing the cost of production, the efficiency or capacity is enhanced."

Heretofore in this class of apparatus, the perforated plates have been arranged upon their bearings either in the form of an octagon or square in horizontal cross section; and the several series of plates have thus been somewhat concentric with the opening through which the gases were admitted to pass through them. The apparatus has thus had to be of considerable size compared with the volume of gas to be treated. To obviate this, the present patentees propose to mount the perforated plates B in their proper relative positions upon bearings C, which retain them in the form of rectangular or oblong bells D.



Clapham's Tar-Extractor.

These rectangular bells are mounted in the positions shown—to carry out what may be styled a side-by-side arrangement of them. It enables a larger number of bells to be mounted in a given space than when other methods of construction are followed. It is also possible to keep the areas of inlets and outlets F G to and from the perforated bells in "more efficient proportion with the bell area." The perforations in the plates are circular in one plate and oblong in the adjoining plate; the circular perforations being made in the plates through which the gas first passes.

To suspend the bells, a circular bracket H is secured to the end of the rod K, on the other end of which is a chain passing over a pulley (supported by a column with a water-locked joint) to carry a counterbalancing weight, so that the bells are enabled to automatically rise and fall within the chamber containing them, in order to vary the area of the perforations they present for the passage of the gas, proportionate to the quantity of gas entering and rising through the passages

within the bells. In this way, the impinging velocity of the gas is kept constant.

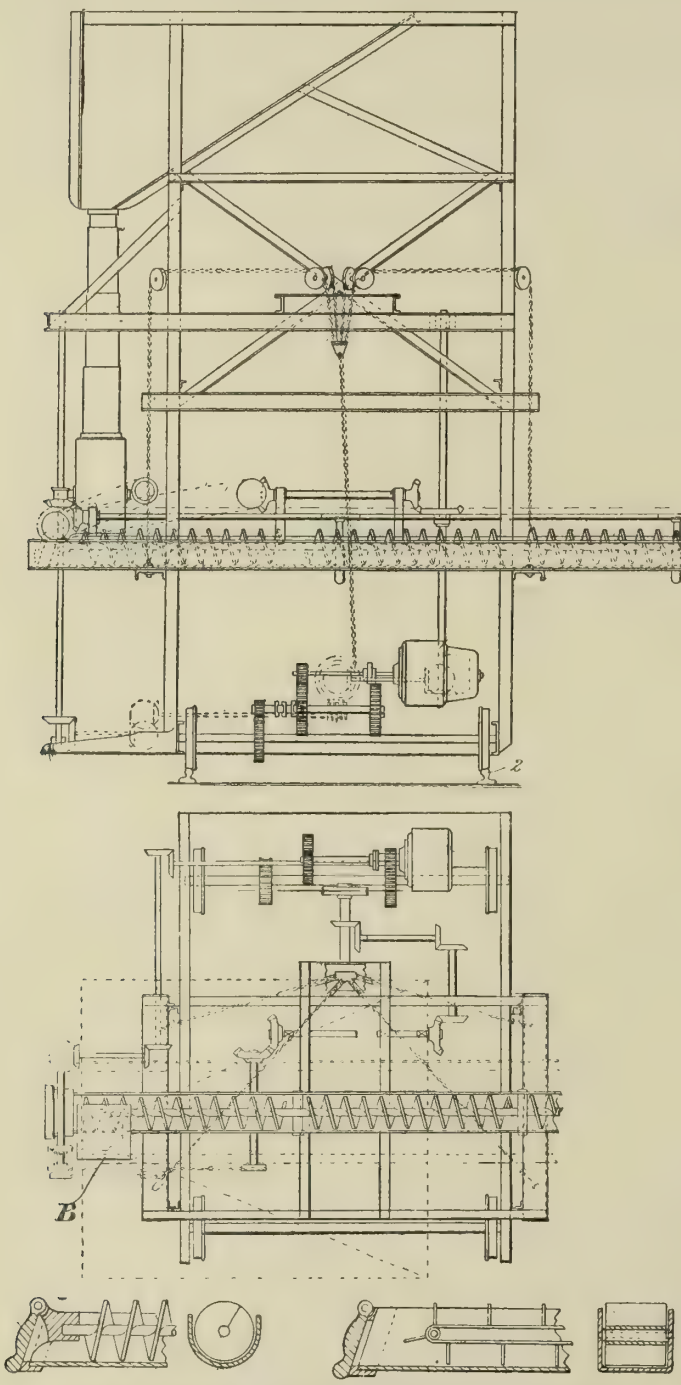
The bells are shown in their lowest position by full lines, while their raised position is shown in broken lines; and their height or position within the chamber R is indicated by a pointer carried by the rod K and sliding within a groove in the column above the vessel.

Charging and Discharging Gas-Retorts.

COLE, W. L., of Bow, and LUDBROOK, S.W., of Stepney, E.

No. 6204; March 14, 1906.

This apparatus for discharging and charging gas-retorts consists of a trough, combined with a screw or chain plate conveyor inside the trough, a hinged pusher-head on one end of the trough, telescopic tubes for conveying coal from a hopper to the trough, and means for operating the trough and conveyor—the operation being that the coal is supplied to the trough while it is being inserted into the retort for its head to eject the coke from the retort; and on the return of the trough, the conveyor is operated to eject the coal from the trough and lay it in the retort. It is of the kind described in C. W. Lyon's patent (No. 3413 of 1891), the specification of which was abstracted and illustrated in the "JOURNAL," Vol. LIX., pp. 249-50.



Cole and Ludbrook's Apparatus for Charging and Discharging Gas-Retorts.

The ejector and charger consists of a long trough containing an archimedean screw, or else chain wheels and chains carrying scraper plates—the trough carrying at one end a pivoted pusher-head, which is freely suspended. The front end of the trough is held in a framework or collar A, in connection, by telescoping tubes B, with a coal-hopper at the upper part of the apparatus. The outlet or inlet of the telescoping tubes is controlled or not by valves C. The trough is connected to any suitable gear to enable it to be raised and lowered; and the archimedean screw or plate conveyor is connected to a motor, either direct or through gear. The hinged pusher-head is of curved shape, and has the lower part formed so that its bottom edge rests on the retort while pushing out the coke.

Suitable mechanism is provided to move the apparatus along the retort-house and to raise and lower the trough and move it for ejecting the coke and recharging the retorts.

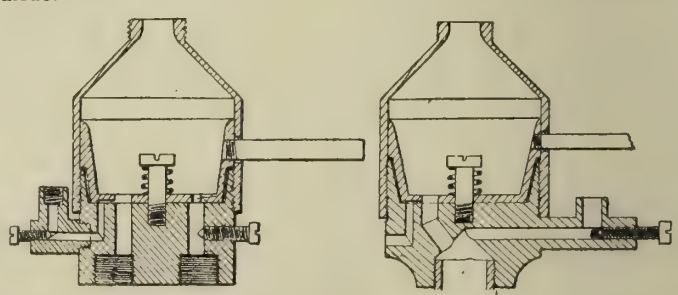
When the trough and screw or plate conveyor have been adjusted as to position to discharge a retort, the trough is pushed forward by chain or other gearing, and at the same time the coal supply from the hopper is established. During the progress of the trough through the retort, the coal is being supplied to the trough in proper quantity, and the pusher-head is ejecting the coke from the other side of the retort; so that by the time the trough has completed its movement and ejected the coke, the trough has had the proper supply of coal introduced all along its length. The coal supply is then shut off. The mechanism is now operated to withdraw the trough, screw, and pusher, and at the same time the archimedean screw or plate conveyor is set in motion. This passes the coal out of the trough at the pusher-head—canting the pusher-head in so doing, so as to allow egress of the coal, and leaves the coal in the retort all along its length as the trough and screw or conveyor recedes. Thus, by the time the trough has left the retort, the screw or conveyor has ejected all the coal and "laid it evenly all along the retort."

Cock for Gas and Air Supply.

ROESSLER, A. C., and the AIR-LIGHT COMPANY, LIMITED, of Victoria Street, S.W.

No. 6794; March 21, 1906.

This invention consists of a cock in which the gas and air to a lighting or heating burner (of the type in which gas and air are supplied separately) are simultaneously controlled so as to preserve the desired proportion of gas and air. One of the principal features of the construction is that the cock is arranged to rotate about the centre line of the burner—*i.e.*, about a vertical instead of the usual horizontal axis. In a modified form the cock may be used for controlling the supply of gas alone.



Roessler's Gas and Air Mixing Cocks.

The valve (as shown) consists of a dished shell, preferably slightly coned and adapted to work in a seating provided with openings communicating with the gas and air inlets to the valve body. These inlets are provided with screws for adjusting the proportions of gas and air; a bye-pass also leads to the valve seat, and may be arranged to be kept continually burning or to be extinguished at such times as the main burners are alight. The valve preferably pivots about a screw, around which there is provided a spring which holds the valve resiliently to its seat. A cover is also provided over the valve (adapted to be screwed on to the valve body at one end and to the burner mixing-tube at the other) and furnished with a circumferential slot, through which passes a lever by which the valve is operated. Ports in the valve are

arranged to control the gas and air passages having their outlet at the valve face.

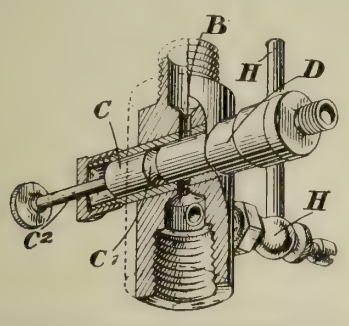
In the modification shown, for use in ordinary gas-lamps when no separate air conduit is employed, the air inlet to the valve body is dispensed with, and there are adjusting screws for altering the proportions. This form of cock is said to be "particularly useful in street lighting, as the horizontal motion of the lever and the arrangement of the cock barrel to rotate about the central line of the burner tend to reduce the vibration in lighting and extinguishing the burner, whereby this form of gas-cock is of particular advantage in connection with incandescent mantles." Further, the lever can be easily found in the dark—a matter of considerable importance in ordinary street lighting effected by a long pole.

Controlling Conduits for Gas or other Fluid.

EDWARDS, A. N., and the PNEUMATIC GAS LIGHTING COMPANY, LIMITED, Farringdon Street, E.C.

No. 23,759; Oct. 25, 1906.

This invention relates to apparatus for controlling a conduit for gas or other fluid by a piston-valve working in a chamber at right angles to the conduit which it controls, and provided with an extension whereby the position of the piston-valve may be locally controlled. This extension is in the form of a rod passing out through an opening at the end of the piston-chamber; and, the patentees remark, if the rod fits loosely in the opening, "the leakage of air past the extension will facilitate the movement of the piston, as there will be but little compression of the air in front of it as it moves towards the end of the chamber."



Pneumatic Lighting and Controlling Device.

The main portion of the fitting is provided with a central bore B (through which the gas passes) controlled by a piston-valve C having in it a groove C^1 and working in a chamber D placed crosswise of the main portion. At one end of the chamber D is a screwed nipple adapted to receive the supply pipe from the source of pressure or suction, and at the other end is a screw cap having a central opening through which passes an extension of the piston. This extension C^2 is furnished with a head so that the piston may be easily moved by the finger.

The fitting is shown in a position which would be suitable for its use with a burner of the ordinary upright type, in which case the gas supply would come from the bottom and pass out at the top through the bore of a screwed nipple to which any burner can be applied. The lower portion of the main body is internally threaded to receive the nipple of the gas supply-pipe; and a bye-pass H is provided having a passage which opens into the interior of the body. Below this opening is a ledge, flange, or collar J, the purpose of which is to prevent any accidental obstruction of the outlet to the bye-pass H by means of the nipple which screws into the fitting.

The supply of gas through the passage B is cut off by the piston C when it is in the position shown; but when it is moved, by suction or pressure, so that the groove C^1 in the piston coincides with the bore B, gas flows through freely.

The local control of the piston by the extension C^2 admits of the piston being easily moved should it stick. Moreover, the employment of a removable screw cap with the extension of the piston passing through it enables the piston to be very readily withdrawn for cleaning purposes. Again, supposing a number of the fittings are employed (say) on a large chandelier, all controlled from one pneumatic apparatus, any individual burners may, by means of the local control device, be readily shut off. On the other hand, where all the burners have been shut off by pneumatic action, any individual light can be turned on and off again locally, without necessitating the actuating of the push or pneumatic switch, probably at some distance away. Moreover, the local control is said to be advantageous in that it enables the gas to be turned up or down locally, quite independently of the switch or push.

Curious Carbon Monoxide Poisoning Case.—Giving evidence at the inquest on a woman named Jordan (aged 43 years), who lived at Rockferry, near Birkenhead, Dr. Noble said he and his partner had attended deceased since June last, when her symptoms were a greyish-coloured skin, hurried breathing, palpitation, general weakness, loss of memory, and inflammation of the nerves. At first he was nonplussed; but eventually he concluded that she was suffering from carbon monoxide poisoning. She used a gas cooking-stove supplied by the Corporation, and had complained of an escape of gas. Witness found an odour of gas in the kitchen. Deceased became worse, and died from paralysis of the heart and respiratory organs, set up by carbon monoxide poisoning. He believed this had been caused by inhalation of the gas. Since this case, he had attended domestics and others suffering in the same manner. The reason was the mixing of carburetted water gas with the coal gas. There was no danger arising from the fumes of the burnt gas. A verdict was returned in accordance with the medical testimony; but the Jury found that it was impossible to state what was the cause of the poisoning.

PARLIAMENTARY INTELLIGENCE.

OPENING OF THE SESSION.

The King's Speech.

The second session of the Second Parliament of the present King was opened last Tuesday by his Majesty (who was accompanied by the Queen), with the usual formalities. The speech from the Throne contained a reference to only one matter in which our readers are at all interested, and that was the announcement that the Legislature would be invited to consider proposals for the amendment of the patent laws and for improving the law relating to the valuation of property in England and Wales. At a subsequent stage of the proceedings, Mr. Lloyd-George and Mr. John Burns, the Presidents of the Board of Trade and the Local Government Board, gave notice of their intention to bring in, on an early day, Bills dealing with these subjects.

Allocation of Private Bills.

At the meeting of the House of Commons last Wednesday, the Chairman of Ways and Means (Mr. A. Emmott) reported that, in accordance with the Standing Orders, he had conferred with the Chairman of Committees of the House of Lords (the Earl of Onslow) to determine in which House the respective Private Bills should be first considered; and they had decided that the following should originate in the Upper House:—

Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Birkenhead Corporation Water Bill, Birmingham Corporation Water Bill, Broadstairs and St. Peter's Urban District Water Bill, Colne Valley Water Bill, Coventry Corporation Water Bill, Devonport Corporation Bill, Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, Heywood and Middleton Water Board Bill, Newquay and District Water Bill, Ogmore and Garw Urban District Council (Water Supply, &c.) Bill, Portishead District Water Bill, St. Neots Urban District Council Bill, Selsey Water and Gas Bill, Sheffield Corporation Bill, South Lincolnshire Water Bill, Southend Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill, Tees Valley Water (Consolidation) Bill, Tynemouth Corporation (Water) Bill, Wisbech Water Bill.

The following Bills will therefore originate in the Commons:—

Annfield Plain and District Gas Bill, Basingstoke Gas Bill, Boston Spa Gas Bill, Brighouse Corporation Bill, Brockenhurst Gas Bill, Bude Gas Bill, Falmouth Gas Bill, Gas Companies (Removal of Sulphur Restrictions) Bill, Grays and Tilbury Gas Bill, Keswick Urban District Council (Water) Bill, King's Norton and Northfield Urban District Council Bill, Kingston-upon-Hull Corporation Bill, Leeds Corporation Bill, Llandrindod Wells Gas Bill, Maidstone Gas Bill, Metropolitan Water Board (Charges, &c.) Bill, Metropolitan Water Board (Various Powers) Bill, Mitcham and Wimbledon District Gas Bill, Penrith Urban District Council Bill, Pontypridd Urban District Council Bill, Shanklin Gas Bill, Worthing Gas Bill.

With the exception of the Boston Spa Gas Bill, in respect of which non-compliance with Standing Orders has been reported, and the Pontypridd Urban District Council Bill, all the Commons Bills have been read the first time.

Petitions against Private Bills.

In accordance with the Commons Standing Order No. 128, which requires petitions against Private Bills to be deposited on or before the 12th of February, the following (among other) petitions have been presented against the Bills named:—

Administrative County of London and District Electric Power Bill, by the Hampton Court and West Kent Gas Companies and the Metropolitan Water Board.

Annfield Plain and District Gas Bill, by the Annfield Plain Urban District Council.

Birkenhead Corporation Water Bill, by the Cheshire County Council.

Boston Spa Gas Bill, by the Bramham Gas Company and the Wetherby District Water Company.

Broadstairs and St. Peter's Urban District Water Bill, by Lord Greville.

Brockenhurst Gas Bill, by the Southampton County Council.

Coventry Corporation Water Bill, by the North Warwickshire Water Company.

Falmouth Gas Bill, by the Falmouth Corporation.

Grays and Tilbury Gas Bill, by the Grays Thurrock Urban District Council and the Orsett Rural District Council.

King's Norton and Northfield Urban District Council Bill, by the Birmingham Corporation and the Worcestershire County Council.

Kingston-upon-Hull Corporation Bill, by the East Hull Gas Company and the Sculcoates Rural District Council.

Leeds Corporation Bill, by the Selby Urban District Council, the York Corporation, and the York Water Company.

Llandrindod Wells Gas Bill, by the Llandrindod Wells Electric Light and Power Company, Limited.

London County Council (Electric Supply) Bill, by the Brentford, Commercial, Crays, Croydon, Dartford, Gaslight and Coke, Hampton Court, South Metropolitan, and West Kent Gas Companies, the South Essex Water Company, and the Metropolitan Water Board.

London Electric Supply Bill, by the Brentford and West Kent Gas Companies and the Metropolitan Water Board.

London Port and Docks Bill, by the Brentford, Commercial, Dartford, Gaslight and Coke, and South Metropolitan Gas Companies.

Maidstone Gas Bill, by the Maidstone Corporation and the Sutton Valence Gas Company.
Metropolitan Water Board (Charges, &c.) Bill, by the Herts and Essex Water-Works Company, Limited.
Metropolitan Water Board (Various Powers) Bill, by the Barnet District, Herts and Essex, Leatherhead and District, Rickmansworth and Uxbridge Valley, South Essex, South-West Suburban, Sutton, and West Surrey Water Companies.
Mitcham and Wimbledon District Gas Bill, by the Croydon Rural District Council, the London and Surrey County Councils, and the Wandsworth and Wimbledon Corporations.
Shanklin Gas Bill, by the inhabitants in the urban district of Sandown and the parish of Newchurch, the Sandown Gas and Coke Company, the Sandown Urban District Council, and the Shanklin Urban District Council.
South Lincolnshire Water Bill, by the Bourne Urban District Council.
Southend Water Bill, by the Laindon and District Gaslight, Coke, and Water Company.
Tees Valley Water (Consolidation) Bill, by the Darlington Corporation.
Worthing Gas Bill, by the East Preston Rural District Council, the Goring and Durrington Parish Councils, and others.

Durham Coal-Owners' Association.

The following letter from Mr. Reginald Guthrie, the Secretary of the Durham Coal-Owners' Association, has been sent to the "JOURNAL" as well as to a large number of other London and Provincial papers: "My attention has been drawn to statements which have appeared in various quarters, that a combination of Durham coal-owners exists for the purpose of raising the price of coal to be supplied to the gas companies. Permit me to inform you that such a statement is absolutely opposed to the facts, and to express regret that such an unfortunate statement should have been made public. Whatever increased price has been, or may be, obtained for coal is entirely owing to increased demand arising from ordinary commercial considerations, and to no artificial cause whatever. In order to avoid the possibility of misunderstanding between the colliery-owners and contractors, I shall feel extremely obliged if you will be good enough to insert this communication in your next issue."

Electrical Calculations Extraordinary.

In a certain provincial town, a question arose as to the lighting of a church, and an estimate was submitted by the local Electric Light Company for the work, using metallic filament lamps (presumably "Tantalum"), with "Holophane" shades. The number of lights reckoned for was 54, and they were stated to be mostly of 180-candle power each. The estimated number of hours burning per annum was 154; the total reputed light was given as 8713 candles; and the cost, at 4½d. per unit, £14 7s. 3d. Now, a generous efficiency to attribute to the lamps named is 1·5 watts per candle-power-hour. This for 156 hours equals 2039 units, which, at the price stated, come to £38 4s. 7d., against the £14 7s. 3d. submitted. In looking at these figures, the question arises as to whether the candle power has not been greatly exaggerated, or the consumption of energy very much understated. It should be mentioned that the Company acknowledged that the candle power was given approximately; and one cannot but regard it as a very wide approximation to the truth. Credit must have been taken for trebling the amount of light by the addition of the shades, or else the candle power was taken at four different angles, added together, and a few ciphers tacked on for convenience in reckoning. But, whatever the process adopted, the calculations are, to say the least, extraordinary.

West Ham Gas Company.

In the report to be presented at the meeting on the 25th inst., the Directors state that the accounts for the half year to Dec. 31 show a balance in net revenue of £45,376, of which £16,443 was brought forward from preceding accounts. The net profit on the half-year's working is therefore £28,933; and the Directors recommend dividends of 5 per cent. per annum on the 5 per cent. preference stock (£4625), and 5⅛ per cent. per annum on the consolidated ordinary stock (£21,675), making together £26,300, and leaving a total of £19,076 to be carried forward. The demand for gas by prepayment meters is still well maintained; nearly 4500 additional installations on this system having been provided during the half year. The ordinary consumption has increased by 1·5 per cent. Since the last report, the Directors have felt justified in reducing the charge for gas from 2s. 10d. to 2s. 9d. per 1000 cubic feet—the reduction taking effect from Michaelmas last. Following the example of the larger gas companies in the Metropolis and elsewhere, the Directors have thought it right that the West Ham Company should assist in promoting a Bill to remove the restrictions in respect of sulphur compounds (other than sulphuretted hydrogen); and this Bill will be submitted for the approval of the proprietors at a special meeting to be held after the ordinary general meeting. The Stock Exchange quotations for the Company's debenture and ordinary stocks have now been extended to cover the issues made in April, 1906.

Cheaper Gas for Tunbridge Wells.—As from the commencement of the present quarter, the price of gas at Tunbridge Wells is to be reduced 2d. per 1000 cubic feet to all consumers, making the charge within the borough 2s. 8d. This concession, it is said, represents a loss of revenue to the Company of about the same amount that 2d. in the pound off the rates would mean to the Corporation. The street lighting will also benefit by the reduction, which will still further handicap the municipal electricity undertaking.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Feb. 11.

(*Before Mr. Justice* RIDLEY *and a Common Jury.*)

Paterson v. South Metropolitan Gas Company.

This was an action brought by Mr. George Paterson for damages for alleged negligence.

Mr. LANGDON, K.C., and Mr. BENSON (instructed by Messrs. Weatherley and Co.) appeared for the plaintiff; Mr. HORACE AVORY, K.C., and Mr. ROSTRON (instructed by Messrs. Hicklin, Washington, and Co.) represented the defendants.

Mr. LANGDON said the plaintiff was a commercial traveller, who in December, 1905, was residing in Hearnville Road, Balham, having his own gas-meter fixed in the cellar. On the 8th of that month, as he was moving to Streatham, he gave notice to the defendants to disconnect and take away the meter. He turned off the gas, removed the fittings and his furniture, and left the key with his next-door neighbour, Mrs. Marriott. On the 11th, the meter not having been removed, he again gave notice to the Gas Company. Ultimately, on the 14th, two of their men obtained the key, went into the cellar, and disconnected the meter, but did not remove it. The next day, the meter not having arrived at Streatham, the plaintiff went to the premises, procured the key from Mrs. Marriott, who told him what the defendants' men had said to her, went down the cellar stairs, and struck a match. An explosion immediately followed, which knocked him down. He rushed upstairs, as soon as he came to himself, was taken into Mrs. Marriott's, his doctor was sent for, and one eye was found to be seriously injured. After being attended to he was taken home. He was under his own doctor's care for three weeks, and was then an out-patient at a hospital for some three months—the injury to his right eye being very serious, and resulting in a partial cataract, and permanent dilatation of the pupil. The defence was a denial of negligence, and a plea of contributory negligence on the part of the plaintiff; but he (Counsel) did not see how either defence could be established. The plaintiff had been for six years in the employment of one firm—his salary and commission amounting to about £200 a year; and he had just entered the service of another on better terms. They kept the position open for him for a few weeks, but had then to fill it up; and he was for some time out of a situation, and even now was not earning as much as he did before.

Mr. *Paterson* was called and gave evidence in great detail to the effect stated by Counsel. He said he struck the match to see where he was after descending the cellar steps, and the explosion occurred instantly. He knew nothing for a second or two; and then he found he was bleeding, and his face was burnt. He rushed up into the street, crying for help, and saying the place was on fire, as he smelt something burning.

Cross-examined: When he went to remove the meter, he took a saw with him to cut the pipe if necessary on the house side of the meter, as the Company's servants had directed his wife. Before he went into the house, Mrs. Marriott told him the meter had been disconnected and was all right—that the men had told her so. He only struck the match to see that he did not stumble against anything which had been left in the cellar; he had just got to the bottom of the stairs.

Mrs. *Mary Paterson*, wife of the plaintiff, spoke to a servant of defendants calling at Sternhold Avenue on Dec. 14, and telling her that if the person who went to fetch the meter found it was only disconnected on the Company's side, he could saw through the pipe to bring it away. Her husband wrapped up the saw in paper when he took it, and she brought it back from the house at Balham in the same condition. She was present when the doctor removed a piece of lead from her husband's eye. He was in bed three weeks.

Nothing material was elicited in cross-examination.

Mrs. *Marriott* gave evidence as to two of the Company's officials calling for the key of the next house on Dec. 14. They returned it shortly afterwards, and told her they had disconnected the gas-meter, and left it quite safe. The next day Mr. Paterson called, and she told him what the men had said. He went in, and the explosion occurred immediately.

Dr. *R. M. Johnson* spoke to the injuries the plaintiff had received. He said there were embedded in the eye several particles of red lead, of which he removed as many as he could at once, and then took plaintiff home in a cab. He attended him for some time, and then recommended him to see a specialist.

Dr. *Lionel Cargill* said he examined the plaintiff on the 30th of March last. He described in technical language the injuries to the right eye, the effect of which was that the sight was much impaired. There was a faint scar on the left eye; but this did not affect the sight. He had about one-sixth of his power of sight left. When he saw him last December, the plaintiff's condition was precisely the same, and would, in his opinion, remain so.

Cross-examined: In March the plaintiff complained of dazzling; and he (witness) advised him to try dark glasses, and get about, and see if he could attend to business.

This concluded the plaintiff's case.

Mr. AVORY, in opening the case for the defendants, said he should ask the Jury, when they had heard the evidence, to come to the conclusion that the explosion took place in the meter itself, and not in the cellar, and that the pipe belonging to the Company was properly disconnected and capped, so that no escape of gas could have taken place. If this were made out, he should ask his Lordship to direct that there was no negligence on the part of the defendants. If the work had been so negligently done that gas escaped from the service-pipe into the cellar, no doubt there would be negligence for which the defendants might be liable; but he should satisfy the Jury that it was physically impossible that the explosion could have arisen from any such cause. In the first place, the supply-pipe, after being disconnected, was tested

immediately after the explosion, and again some days later, and found to be perfectly secure. In the next place, the meter was blown to pieces by the explosion; but there was no damage to either the roof or the walls of the cellar. It was obvious, therefore, that what really happened was this: The plaintiff must have brought a naked light close to the orifice of the meter, which would still contain a certain quantity of gas mixed with air, and this exploded. The meter belonged to the plaintiff, and it was no part of the Company's duty to remove such a meter or empty it of any gas which might be left in it. If, as was said by the plaintiff, the whole cellar was full of gas, the dining-room and passage above must also have been full of it, and it must have been smelt by anyone entering the house. If, as appeared to be the case, the plaintiff was not certain whether or not the meter was disconnected on the house side—and he took a saw with him in case it should not be so—and struck a match to see, it would account for the whole thing.

Arthur Skeet, a gas-fitter in the defendants' service, gave evidence as to disconnecting the meter on Dec. 14; a man named Walker being with him. It was dark, so he lit a candle, went into the cellar, disconnected the inlet, and capped the service. He tried the cap with a light, and then cut the outlet pipe of the meter; leaving it standing on the shelf. He took the state of the meter, and noted it on the card, then went up to the scullery and disconnected the cooker. About a week after the accident, he went to the house again, with Mr. Millar, and there was no gas escaping then.

Cross-examined: He told Mrs. Marriott the place was safe. He meant that anyone could go into the cellar with a light without danger. When he went the first time, some gas would have escaped from the service-pipe if the cap had not been put on immediately. The gas left in the meter would gradually escape into the cellar; but he did not think there would be enough to cause an explosion. The tap was unscrewed, and the cap screwed on immediately. He did not apply a light to the meter before leaving; it was not the practice to do so.

Re-examined: When he capped the service-pipe, the quantity of gas escaping would be so small that he could not estimate it. It would all have disappeared from the cellar in an hour or two. The meter was left open at each end. When he went to the house, there were no signs on the walls of the cellar of any explosion having occurred.

Joseph Walker, a labourer who accompanied the last witness to disconnect the meter, corroborated his evidence.

William Edward Jones, another gas-fitter in defendants' employ, who was in the neighbourhood when the accident happened, spoke to going into the house, and finding smoke in the cellar, but detecting no smell of gas. The builder of the house was there; and he invited him to come down and see for himself. He struck a match in the cellar, and tested the service-pipe; and there was no escape of gas whatever. The meter was on the floor, 3 or 4 feet from the shelf on which it stood. It was a perfect wreck. There was no appearance of an explosion in the cellar itself.

Mr. *A. W. Millar*, Outdoor Superintendent to the defendants, said he visited the cellar with Skeet on Dec. 20, and examined the walls and roof. There was no discoloration or other sign of explosion; and there was no escape from the service-pipe. In his opinion, the explosion could not have taken place, as the plaintiff had stated, or more injury would have been done both to the plaintiff and the premises; while the meter would not have been wrecked as it was. When the meter was disconnected, there would be possibly one-third of a cubic foot of gas left in it. There would be no danger in this, unless a light were applied to one of the orifices. It was not practicable to entirely clear the meter of gas; the diaphragms would always remain impregnated.

Cross-examined: He considered the plaintiff's account of the accident was an impossible one, if he stood where he said he did. The most explosive mixture of gas and air was about 1:7. On Dec. 20, the plaintiff gave him practically the same account of the accident as he had just given.

Re-examined: He told the plaintiff that they had found the meter shattered—nothing further. The capacity of the cellar was about 730 cubic feet. If one-third of a cubic foot of gas escaped into this space, it would not form an explosive mixture. Between 2 and 3 per cent. of gas in air was not explosive.

Professor *Vivian B. Lewes* stated that on July 20 last, in company with Sir Boverton Redwood, he inspected the cellar in question, which was fairly represented by the model produced. It was ventilated as shown. The floor-boards of the passage above the cellar had shrunk, and in some places there were gaps of $\frac{1}{8}$ inch. If there had been any escape of gas in the cellar for 24 hours, the smell would have been very strong all over the house. The service-pipe was properly capped, and was gas-tight. He now saw the remains of the meter for the first time. The appearance of the cellar was inconsistent with there having been an explosion of any consequence in the cellar itself. The small splinters of wood on the rough boards would have been scorched, and there was an accumulation of cobwebs in the coal shoot which would have been swept away. The explosion must have taken place in the inside of the meter. If it had been reduced to its present condition by an explosion outside of it, the plaintiff would never have left the cellar alive. If one-third of a cubic foot of gas were left in the meter on Dec. 14, its escape into the cellar could not have created an explosive mixture the next day. The light must have been held within an inch of the inlet or outlet of the meter to cause the explosion. The meter was about three paces from the foot of the stairs. The plaintiff's evidence was quite consistent with this. All depended on the difference between one step and two or three; and after such an accident, a man's memory was not very accurate on such minutiæ.

Cross-examined: One could get a slight explosion if the mixture were weak; and a slight explosion might lead to a violent one if there were a highly explosive mixture within reach of the flame of the first explosion. A slight explosion in the cellar, the flame of which reached the meter, would have caused the explosion.

Re-examined: There could not have been such a slight explosion in the cellar without scorching the boards. The red lead found in the plaintiff's eye must have come from the inside of the meter.

Sir *Boverton Redwood* deposed to visiting the cellar with Professor Lewes. In his opinion, the accident was not caused by an explosive mixture in the cellar. His reasons for this opinion were the same as those given by the last witness. It occurred solely in the meter.

Mr. *H. E. Jones* said the way in which the meter had been disconnected, as given in evidence, was the ordinary and proper one.

Mr. AVORY then summed up the defendants' case, and submitted that the Jury must come to the conclusion that there had been no explosion except inside the meter, and that this must have taken place as the result of the plaintiff bringing the match close to one of the orifices. If this were so, he should ask his Lordship to say that there was no negligence on the part of defendants in leaving a small quantity of gas in the plaintiff's meter; and though they must sympathize with him, they could not hold the defendants liable.

Mr. LANGDON, in his reply, relied mainly on the statement made by the workman to Mrs. Marriott that it was all safe. According to the defendants' evidence, the meter having been disconnected, there was a dangerous trap left, into which anyone might fall; and yet they said it was all right. He submitted further that the defendants' elaborate theory as to the explosion was not made out, but that the plaintiff's account was correct; and that his own theory, that a slight explosion occurred outside the meter, and then exploded the mixture inside, agreed perfectly with both the plaintiff's statement and the defendants' theory. He concluded with a few remarks on the amount of damages.

Justice RIDLEY then summed up. He said, in his view of the law, the Company would not be responsible if the explosion took place solely inside the meter. He then went through the evidence, and commented upon it; ultimately leaving it to the Jury to say how, in their opinion, the explosion occurred.

After a short deliberation,

The FOREMAN said the verdict of the Jury was for the defendants, as they thought the accident arose from applying a light to the orifice of the meter.

Mr. LANGDON asked for a stay of execution as to costs, on the ground that, even if the Jury were right as to the cause of the accident, the plaintiff was still entitled, as a matter of law, to the verdict.

Justice RIDLEY said he did not think it was arguable. He should not attempt to stop Mr. Langdon arguing it, but he had no doubt about it.

Mr. LANGDON said he did not desire to press the matter unduly; but it would be very hard on the plaintiff to have to pay the costs, if it turned out afterwards that he was right.

Justice RIDLEY said he did not entertain any doubt on the point, and must decline to grant a stay.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Jan. 28.

(*Before the* LORD CHIEF JUSTICE *without a Jury, by consent.*)

English v. Metropolitan Water Board.

The hearing of this case, the earlier proceedings in which were reported last week (p. 291), was continued to-day.

Mr. TINDAL ATKINSON, K.C., Mr. FITZGERALD, K.C., and Mr. BAILHACHE (instructed by Messrs. Deacon, Gibson, Medcalf, and Marriott) appeared for the plaintiff; Mr. ELDON BANKES, K.C., and Mr. A. B. SHAW (instructed by Mr. Walter Moore) represented the defendants.

The evidence of Colonel *Dale* having been concluded,

Mr. *Hennell*, Engineer to the Darenth Drainage Board, gave evidence as to the quantity of water flowing into Colonel English's pond on certain dates when pumping was going on, and when operations were suspended.

Mr. *Gilman*, a member of the Fishing Preservation Society, spoke to the diminution in the quantity of water in the stream and pond after the pumping commenced, and also as to the pollution by oil or grease. The stream had a great reputation as a trout spawning-ground before the pumping.

Mr. *Douglas English*, son of the plaintiff, produced a number of photographs, and gave evidence generally in support of the claim.

Mr. *James Armstrong*, the Manager of the Hawley Paper Mills, which adjoin the plaintiff's property, gave similar evidence.

Mr. BANKES, in opening the case for the defendants, said they claimed the benefit of the Public Authorities Protection Act, which limited any action for damages of this kind to six months before the issue of the writ; and this would be an answer to the charge of polluting the stream, even if it were not disproved otherwise. The principal point, however, was the claim to restrain the defendants from pumping water. On this four questions would arise—(1) whether this pumping-station was not being worked under statutory authority; (2) whether what was complained of was an actionable wrong at all; (3) if it was, whether it amounted to a nuisance; and (4), assuming that the other points were found against him, what was the proper form of remedy. The real cause of the complaint was that the level of the subsoil water had been lowered; but this he should submit gave no right of action.

Mr. *G. R. Strachan* was the first witness called; and he was under examination when the Court rose.

Tuesday, Jan. 29.

Mr. *Strachan* continued this morning his evidence on behalf of the defendants. In November and December last and the present month he investigated the pumping-station and the stream in question, and directed careful gaugings to be made of the water entering and leaving the premises. These gaugings were made every three hours for more than a month, under the inspection of his chief assistant. He gave a minute description of the well, boreholes, and other works, and produced three large diagrams on which he had plotted the results of his observations. The total volume of water pumped was about $1\frac{3}{4}$ million gallons per day. On Nov. 24, he had the engines stopped for two or three hours, and the result was to raise the level of water in the well 10 feet in one hour and 12 feet in two hours; the latter level being 6 inches above that of the stream just outside. The quantity of water abstracted from the stream during its passage through the defendants'

premises varied both seasonally and diurnally. On some days it was 28,000 gallons, and on others only 16,000 gallons; and as the pumps were always going at a regular speed, he attributed any amount above the 16,000 gallons to pumping operations elsewhere, which lowered the level of the subsoil water, and thus withdrew the support to the water on the surface. In conclusion, he expressed a decided opinion that any pollution of the stream by the defendants was rendered impossible by the filters which had been made.

Witness was cross-examined at some length, but he adhered to the view that the water the loss of which the plaintiff complained of went into the subsoil generally, and not into the defendants' works, except to the extent of 16 000 gallons a day. He had not seen the stream in the summer, and had no measurements for that time of year. He could not make any suggestion which could account for what appeared to be oily scum on some of the photographs.

Mr. *Baldwin Latham* said he had heard Mr. Strachan's evidence, and agreed generally with his conclusions. In the year 1878, he made a complete survey of the Darent Valley. The gathering-ground of this station was 94 square miles. He examined the site for the Kent Water Company in 1903, and two years later for the Metropolitan Water Board, when Colonel English's pond had just been formed. It was dug in porous gravel. He had recently visited it again, and, under his advice, certain trial holes were made. On Jan. 24, he found the difference between the amount of water entering and leaving the defendants' premises was 18,000 gallons in the 24 hours. On that occasion there was a little water in the lower part of what was called the "tributary stream," flowing away from the pumping-station. The diminution of water in the stream was undoubtedly due to the lowering of the subsoil water. He also spoke to the propriety of the means taken to prevent any pollution of the stream.

Mr. *W. B. Bryan*, the Chief Engineer to the Metropolitan Water Board, said he had examined Mr. Strachan's diagrams, and agreed with the conclusion he had drawn, that the effect of the pumping was to reduce the level of the subsoil water to the extent of from 10 to 12 inches. He did not think any water from the brook found its way into the well. There was a distinct flow of water in the gravel, apart from that in the chalk. The Water Board had no desire to take any water from the gravel; on the contrary, great expense had been incurred for the purpose of excluding it. He did not think the well affected the surface water for a distance of more than 30 or 40 feet. He agreed with the previous witnesses on the question of pollution. Some sample bottles of water which had been produced by the plaintiff were shown to the witness, who said he could not see any oily contamination; and it was arranged that the samples should be analyzed.

Mr. *William Morris*, a District Engineer of the Metropolitan Water Board, and previously Engineer to the Kent Water Company, said he recollected inspecting the locality in question in 1885 and again in 1899. On the former occasion, he noticed a great many fish in the stream; but on the second he saw none. The pumping-station was purchased in 1900, and the sinking was commenced in September of that year. By October, 1902, the present works were completed; and the sinking of the well and boreholes was finished in February, 1903. Witness gave details of the works, and produced plans and sections of them. He explained that by lining the well with steel tubes and sealing the boreholes the quantity of water pumped was reduced by about a million gallons daily. After describing the means adopted to prevent the escape of oily matter, witness said he was sure that since May, 1906, no oil had found its way into the stream, and only slight traces after June, 1905.

In cross-examination, witness admitted that when sinking the well the chalk that was extracted was thrown into the stream, and might have slightly raised the bed. He did not know anything about the effect on the fish.

R. B. Hocking, the engine-driver in charge of the pumping-station, gave evidence as to the proper working of the filters. He said a pint of oil was used daily in the engine-house.

Mr. *W. G. Morris*, son of a previous witness, an Assistant District Engineer to the defendants, said he inspected the site in 1899 in company with his father, but saw no fish there then, and he was a keen fisherman. In his opinion, the stream looked much the same now as it did in 1899.

Dr. *Alexander Houston*, the Director of Water Examinations to the defendants, spoke to examining three samples of water taken in July last from the stream in question; and they were purer than average samples from the Thames and Lea. The sample drawn where the water left the defendants' premises was slightly better than one taken where it entered. There was nothing to indicate that it would in the slightest injure fish.

Cross-examined: He remembered going in March last year to see some samples of water taken by Colonel English, but could not say that he put his finger into one of the bottles and found the water was oily; nor had he any recollection of being asked to analyze the samples. If he had been, he should probably have refused. Several bottles being shown to witness, he could not say positively whether any of them did or did not contain engine oil.

Mr. *T. L. Humphreys*, a clerk in the Solicitors' Department of the Metropolitan Water Board, spoke to going with Mr. Morris to the pumping-station last July, and meeting Colonel English. The latter pointed out what he said was oily scum; but Mr. Morris did not agree with him. On that occasion the water was flowing from the Darent, and he saw a lot of oil on the water in the river. He could see about 60 yards of the surface, and it was covered with a film of oil.

This completed the evidence, subject to the production of analyses of water, and the further hearing was again adjourned.

His Lordship intimated that it would be more satisfactory to him to inspect the premises himself before giving judgment.

This was agreed to by both parties.

Wednesday, Jan. 30.

On the resumption of the case this morning,

Mr. Atkinson said the analyses of the water had not been completed, but they should be forwarded to his Lordship, if they were not ready before the argument was concluded.

Mr. Bankes, on behalf of the defendants, said it seemed worthy of consideration whether this was a genuine action on the part of Colonel English in respect of any injury he had really sustained, or was not an attempt by a certain body of persons, of whom the plaintiff was one, to stop altogether the pumping at this place, in order to obtain an ulterior object in respect of which there was no legal remedy. No stress had been laid, in the evidence, on any injury suffered by the plaintiff—in fact, his name did not appear in the course of the correspondence which preceded the action, until just before the writ was issued—the complaints being all made on behalf of the Darenth Fishing Preservation Society, and being for the most part confined to the question of pollution. The plaintiff was a riparian owner for about 80 yards only along the stream in question, because he could not enlarge his rights by making the cross-cut from the pond to the Darent. With regard to the pond also, he submitted that it was not primarily made for the purpose of watering cattle, but as a sort of observation hole, to see how much water was abstracted; and the bottom was purposely kept clean, so that as much water as possible should drain away from it. After dealing shortly with the question of pollution, the learned Counsel referred to the Metropolis Water Act, 1902, and the Public Authorities Protection Act, and submitted that under the latter no claim could be made for damage caused more than six months before the issue of the writ. Turning to the more important point of the abstraction of water, he cited various authorities, which he submitted showed that a person was absolutely entitled to withdraw any quantity of subsoil water, so as to prevent it getting to the surface. In this way he could absolutely pump a stream dry; and it would be very strange if, in consequence of a temporary stoppage of pumping, water got into the stream, he could then be restrained from pumping in future, because he would be taking the water from a defined channel. The Kent Water Company had statutory power to make the well, which was the first step. It was thoroughly established that there was no right of support to land by water; and it seemed to follow that there was no right of support to water. In the case of *Sugar v. Grand Junction Canal Company*, the water was taken by a lateral cut—it was not a question of support at all; and this case had been commented on and explained in *Jordeson v. Sutton, Southcoates, and Drypool Gas Company*, in the Court of Appeal.* He was proceeding to argue against the granting of an injunction in this case, when his Lordship intimated that he need not pursue the matter further.

Mr. Atkinson, in reply, said he hoped to show that the plaintiff was entitled to an injunction in a case like the present, where the defendants insisted on their right to do what they were doing. The Act of 1888, under which this pumping-station was acquired and erected, contained a provision that nothing therein should exonerate the Company from any action, indictment, &c., for nuisance, in the event of any being caused by them; and he submitted that this action, if unlawful, was a nuisance. The Public Authorities Protection Act did not here apply, because the Act of 1902 transferred all liabilities of the Kent Company to the Metropolitan Water Board; and a cause of action then existing would inure against the present defendants. He went on to refer to some previous decisions as to the right to water, and relied particularly on a statement in the House of Lords that if it was not possible to get at the underground water without touching that which was flowing in a defined channel on the surface, one could not get it at all. The practical difficulty which had been raised by Mr. Bankes in the interest of the public, that pumping would have to be stopped altogether, was quite illusory, because all the defendants would have to do would be to send down the stream as much water as they abstracted from it, which was a very small proportion of the quantity pumped. He concluded by commenting on the evidence with regard to the pollution.

The case was then adjourned for the analyses of the water to be put in.

Thursday, Jan. 31.

This morning a report was handed in, and

Dr. *J. A. Voelcker* was called, and gave evidence with regard to it. He said he had examined samples taken on March 2 and 6, June 12, and Oct. 5. In the March and October samples, he found oily matter present; but that taken in June was practically free. He could say certainly that in the October sample there was mineral oil; and he had reason to think there was some in the March samples, but was not so positive. The examination was very difficult, owing to the length of time the samples had been kept, during which there had been considerable vegetable and fungoid growth. He could not express any opinion whether the mineral oil present was more likely to have come from a paper-mill or a pumping-station. The oil in itself would not be injurious to fish; but indirectly, by forming a scum on the surface, it would prevent proper aëration and oxidation of the water, and in this way would be very prejudicial to fish life.

The case stood over for judgment.

Thursday, Feb. 14.

The Lord Chief Justice delivered his considered judgment this morning. After stating the nature of the action, the position of the pumping-station, and the character of the works—consisting of a well 110 feet deep, lined to a depth of 75 feet with steel cylinders, and two boreholes, 131 feet deep, similarly lined, one of which communicated with the well, by an adit—he said the matters of which the plaintiff complained were three. The first was the pollution of the brook which adjoined his land, and the cross cut connected with it, by chalk mud, deposited in the brook by the Kent Water-Works Company, when the well and boreholes were sunk, which was not disputed; and the second, pollution by oil and grease from the engines at the pumping-station. As to this his Lordship went carefully through the evidence, and arrived at the conclusion that some pollution had occurred on several occasions, which was an injury to the plaintiff, though he had little doubt that with reasonable care the filtering works constructed by the defendants for the purpose of preventing such pollution would, if properly managed, avoid any appreciable nuisance from such a cause in future. With

* See "Journal," Vol. LXXIII., pp. 807, 992, 1381, 1766.

regard to these two matters, the defendants relied on the Public Bodies Protection Act (56 & 57 Vict., cap. 61). But the plaintiff contended that this Act did not apply to the Kent Water Company, and that, having regard to the terms of the Metropolitan Water Act, 1902, the defendants were responsible for what was done by their predecessors. He thought the contention was well founded; and he assessed at £100 the damage to plaintiff arising from these two causes. The third and most important matter of complaint was the abstraction of water from the brook, which it was alleged by the plaintiff's witnesses was never dry, winter or summer, before the operations at the pumping-station commenced, whereas it was now admitted by the defendants that the quantity of water flowing down the brook was diminished by their operations to the extent of from 16,000 to 28,000 gallons per day; and the evidence showed that for a period of six weeks in 1905, the brook was practically dry. The plantiff's witnesses put the amount abstracted at from 26,000 to 110,000 gallons per day; but their measurements were taken with less exactitude, and at a different point, below a pond which the plaintiff had dug; and, in his (his Lordship's) opinion, the existence of this pond substantially diminished the quantity of water passing in consequence of percolation through the bottom. Still, the admitted loss of 16,000 gallons per day was substantial, and might in summer time be of considerable value; and, if the defendants' acts could not be justified, it would entitle the plaintiff to damages, and possibly to an injunction. This raised an interesting and difficult question of law. As he had already stated, the well and boreholes were steel-lined to a great depth, for the purpose of excluding the surface water; and he found as a fact that no water from the brook got into the well, and therefore none was pumped by the defendants. The diminution was, in his opinion, due to another cause—viz., to the withdrawal of support by a fall in level of the underground water. This was established by the diagram put in by Mr. Strachan, as well as by the evidence, which showed that the 1¾ million gallons of water pumped daily was derived, not from the surface, but from a vast underground body of water flowing through the fissures in the chalk. The analysis of the water pumped at Darenth showed it to be of exceptional purity, without any trace of admixture with surface water. His Lordship then dealt with the contention set up by the defendants that they were authorized by statute to do what they were doing, and said that, in his view, this was immaterial, because section 8 of the Kent Company's Act of 1888 expressly provided that nothing in the section should exonerate the Company from any action, indictment, or other proceeding, in the event of any nuisance being caused by them. He could not accept the contention of Mr. Bankes that the words used applied only to the construction of the works, and not to their maintenance and working. The act complained of was the alleged abstraction of water from the brook, to the flow of which the plaintiff, as riparian owner, was entitled; and it seemed to him that an action founded on such a claim would be an action for nuisance. This was in accordance with the definition of the word "nuisance" in Blackstone and other text-books, and was covered by the decision in the case of *Jordeson v. Sutton, Southcoates, and Drypool Gas Company*. He thought therefore that the statutes under which the defendants were working afforded them no protection if the act complained of gave rise to a good cause of action at common law. He thus came finally to the difficult question whether the abstraction of water under the circumstances of this case gave the plaintiff a cause of action. The plaintiff relied on the case of the *Grand Junction Company v. Shugar*, the head note to which said: "Although a landowner will not in general be restrained from drawing off the subterranean water in the adjoining land, yet he will be restrained if in doing so he draws off the water flowing in a defined surface channel through the adjoining land." The question was as to the precise meaning of the words "drawing off." If it had been shown that the defendants, by their operations, had directly drained or tapped water from the brook, he should have applied the principle of the judgment in Shugar's case; but, having regard to the authorities, he was of opinion that the diminution in quantity by the withdrawal of support did not come within the principle laid down. Having found as a fact that no water from the brook got into the defendants' well, and that the only effect of the pumping was to lower the level of the subsoil water from 10 to 12 inches, he came to the conclusion that, though not expressly protected by statute, no action could be maintained by the plaintiff against the defendants in respect of the abstraction of water. Had he taken a different view, it would clearly not have been a case for injunction. The damage occasioned in the past was comparatively trifling; and under no circumstances should he have assessed the amount at more than £50. The result would be that the plaintiff would have judgment for £100 with costs; but the defendants would have the costs occasioned by the insertion of the claim for the abstraction of water, on which the action failed—one set of costs to be set off against the other.

Inequality of Water-Rates.

At the Westminster County Court last Friday, a summons by the Metropolitan Water Board against Mrs. Greenland was one of 106 claims for water-rate heard by the Registrar (Mr. C. R. Cuff). The defendant, a resident in Fairfax Road, Hornsey, appeared in person; and Mr. Desmond Collins, the Assistant-Solicitor to the Board, supported the claim. Mrs. Greenland said she had paid the same amount as her neighbour; and she contended that this was all the Board could recover, as the rent and local rates for the house next door were precisely the same as hers. Mr. Collins said defendant resided in the borough of Hornsey, which was not in the Metropolis. Being out of the Metropolitan area, the Board had to assess the value; and the system was to assess a fair rental value and deduct one-fifth or one-sixth for insurance and repairs. The Registrar went into the figures, and said he could not hold that the assessment was unfair. He therefore ordered the defendant to pay the amount claimed.

At a recent meeting of the Teignmouth Urban District Council, it was decided to apply to the Local Government Board for authority to borrow £150 for additional retorts at the gas-works, and to inform them that £540 would be required for telescoping the gasholder.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the City Terminus Hotel, Cannon Street, E.C., last Wednesday—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the advertisement convening the meeting, and also the minutes of the last half-yearly meeting. The seal of the Company was then affixed to the register of proprietors, and the report and accounts, for the six months ending Dec. 31, which have already appeared in the "JOURNAL," were taken as read.

THE COMPANY'S STOCK—THE REPORT AND ACCOUNTS.

The CHAIRMAN: Ladies and gentlemen, as usual, we have been as explicit as possible in the accounts, and up to last night I thought there would be very little for me to say about them; but in what may be called the Money Article in the "JOURNAL OF GAS LIGHTING," which I was reading last night, I read that they were unsatisfactory. It said that there was a fall of one point in the South Metropolitan stock owing to the unsatisfactory character of the half-yearly report. Well, as to the stock, it stands pretty well as compared with that of the other Companies; the 4 per cent. stock standing at 128, while the Gaslight and Coke Company's 4 per cent. stock, after a very satisfactory report and meeting, went from 100 up to 101, but has now gone to below 100, and the Commercial Company's 4 per cent. stock stands at 112. So that I do not think there is anything very unsatisfactory in the position of the South Metropolitan Company's stock. Now as to the report. In speaking about this, I do not want to make comparisons, but one must refer to one or two points, and anybody speaking about the report of the South Metropolitan Company, and having in his mind the reports of the two other London Companies, must never forget the difference in price, and that we are selling gas at a much lower figure than they are. We are £15,000 short on the half year. But if we had charged the same price as one of these Companies, we should have had £120,000 to the good; and if we had charged the same price as the other Company, we should have had £240,000. This shows the necessity of considering the question of the price of gas. There is a deficiency of £9000. In June, 1904, we started with an undivided balance in hand of about £65,000; and having had a good half year, we reduced the price from 2s. 1d. to 2s. I am not sure that this would have been done by other people; but the South Metropolitan Company's policy has always been to reduce the price whenever we have had the opportunity, and felt ourselves able to do it. There was a big drop in coke immediately afterwards; and the result was that in the December half of 1904 there was a considerable deficiency—something like £28,000. But the £65,000 with which we started in June, 1904, has lasted us up to the present time, and there was about £6000 left when we entered on the December half year. The £15,000 will absorb the £6000, and leave £9000 as the net deficiency; and I have no doubt that this £9000 will be recouped in the June half year. But there is something more to be said. The June half years are always the best; and I will tell you why. We cannot take the indices of the consumers' meters on a fixed day. We cannot take them all on the 31st of December and the 30th of June; it is a work of about three weeks—about two weeks in the latter part of December, leaving one week in January, and the same in June. The consequence is that a considerable proportion of the consumers' accounts are made up to some date in December; and whatever gas they burn after that date goes into the June half year, and is paid for in it. Then the same thing happens in June. But in the fourteen or fifteen days at the end of December a great deal more gas is burnt than in the fourteen or fifteen days in June; and consequently the June half year gains, the December half loses. The South Metropolitan Company have only once (1893) had to record a decrease in the consumption. In the present year, there is an increase of 1¼ per cent. We explain in the report how it is that this is so small. It is rather owing to our pushing the use of the incandescent mantle. Anyone who will go into South London—it is an out-of-the-way place, and not many people travel to it except those who live there—will find in the streets, if they look into the shops, both big and little, the incandescent mantle everywhere, and the shops magnificently lighted. The unaccounted-for gas in the June half year was 1·46 per cent., and in the December half year 6·2 per cent.; giving an average for the year of 3¾ per cent., which is a very low figure.

THE PRICE OF COAL.

I now come to the paragraphs of the report which deal with coal. I may say at the outset that cheap fuel, solid or gaseous, is as necessary for England as cheap bread; and, notwithstanding the fact that people are finding fault with the gas companies for talking about or objecting to pay increased prices for coal, we are bound to protest, and do everything we can to prevent the charges increasing. The coalowners are now saying: "Oh, we lose money at all ordinary times, and we only look to make up the loss by these booms; and here you gas people are grudging us these." I have been pretty well acquainted with the history of the gas coal trade for many years. Prior to 1872, the price was uniform, and never varied more than a few pence per ton; and 6s. was about the maximum price—5s. 6d. to 6s. But in 1872 there came the first coal panic, and the price then went up. I am speaking of the price free on board in the Tyne—at the pit's mouth, you may say—for gas coal. In those two years, 1872-3, the price went up to 20s. per ton free on board; and it was 1877 before it came back again to the old figure. This was a very trying time for gas people. But they got through it, and then we went on with a fairly average medium price up to 1890. The year 1872 was the beginning of the first boom; the next one began in 1890; the next in 1899; the next in 1906. So they are coming rather too close. We went on very well from 1876 to 1889, and then prices began to rise again. Our contract prices in the seventies were about 6s. per ton. In 1889 they went up to 7s., and in 1890 to 11s. Then they began to go down again; and

in 1893 the price had dropped to 6s. 3d.—had got back to the old figure. So it remained for several years—6s. 3d., 6s. 4½d., 6s. 6d., 6s. 9d.—until in 1899 our contracts went up to 7s. 11d., or a rise of 1s. 2d. In 1900 the price rose to 16s., and then began to fall; but there were five years of high prices. In fact, prices have been high all the time, and have never come back to the figure of 6s. 6d. The price returned to 7s. 6d. in 1904-5; in 1906 it went up to 8s. 3d.; and this year we are threatened with I do not know what. I protest with all my power against this doctrine of the coalowners that they must have these booms in order to recoup themselves. We do not object to paying a fair, reasonable, and legitimate price to coalowners or anybody else at all times; but we do object most strongly, and as emphatically as it is possible to object, to these outrageous increases of price, which are so disastrous to the gas industry and the country in every way. What is the reason for them? I daresay you have seen a good deal about it in the newspapers. I have here a cutting from the "Standard" of the 7th of this month. They had been inquiring into the subject of the coal trade: "Another gentleman laid the blame mainly upon the export trade. 'The great demand,' said this gentleman, 'comes from German, French, and Belgian manufacturing centres; and what is needed to put things right is not so much agitation against the high price of coal as a reform of our fiscal system.'" Well, I am not going into that thorny subject. The statement there, according to all I can learn and all that we can ascertain, is one of simple fact. The increase in the price of coal is greatly due to the large foreign rather than to the English demand. This statement is corroborated in other quarters. It is due to the large foreign demand, which has increased very much since the coal duty was taken off. Now, I am a Free Trader, but I am not going to argue that question. There is much to be said on both sides, no doubt; but there is one point on which I feel strongly. The foreigner imposes a heavy duty on all our manufactured goods; but he is wise enough to admit coal free of duty. Now, what are we doing? We are supplying him with cheap coal to enable him to compete with us in our own markets and in those of the world. [Loud cheers.] I do think that the action of the Chancellor of the Exchequer last year is inexplicable. I cannot understand why he should have taken off that 1s. a ton duty on exported coal.

A Shareholder: He never ought to have taken it off.

The Chairman: You are quite right, sir; and why it was taken off one does not know, but can only guess. At any rate, the effect has been to largely increase the foreign demand; and it has enabled our coalowners to get better prices for their coal. There is another thing. The duty was limited to coal above 6s. per ton in price free on board, and whereas prior to taking off the duty the price was 6s., or just under it, for small steams, directly the duty was taken off, up went the price of small steam coals to 7s. and 8s., and our own manufacturers have to pay these higher prices for steam coal simply because the market abroad was opened to them. Well, it is a very wide question, and one looks at it from a rather broader view than simply that of the gas people or the immediate users of the coal. Coal is the nation's capital. Without coal, where should we be? Where could we be? We are dependent upon it for our existence as a nation. If coal becomes dearer, we are necessarily and naturally falling behind in the race of nations; and if it becomes, as it will become, dearer, if this principle of exporting all that is possible is continued, what will posterity say if we, in our fatuity, have parted with, to the foreigner, that on which Britain's greatness in a material sense depends? My own feeling on the matter is that, for the protection of our own national interests, no coal ought to be allowed to be exported. We cannot, I suppose, do this; but we can impose a duty on it that would practically prohibit its export, and whether I am a Free Trader or not, I certainly go for that. Now, these coalowners are making a good deal of fuss about it, but here is one gentleman—the chairman—speaking at a dinner given to a Quayside veteran, the "fitter" of an important colliery. He says: "There are times in the history of every colliery when it is impossible to work at a profit, and owners often are thankful if, after providing for the necessary depreciation, their accounts do not show a loss. I know of no industry that exacts such sacrifices and demands the exercise of such skill, care, and attention. I also know of none to which a fair measure of profit in prosperous times is so bitterly grudged by the mercantile community at large—whether it be shipowners, gas companies, ironmasters, coking concerns. They all seem to grudge collieries an occasional meed of profit." When coalowners state that they make no profits except on these booms, I am not quite prepared to accept all they say. Now, this gentleman goes further, and says that "gas companies vie with one another in stoutly demurring to pay the fair market price of the day." Well, you will be rather surprised to hear that the speaker is a gas director, and his principals have just negotiated the sale of coal to the Stockholm Gas Company at the price of 12s. 6d. per ton, which is an advance of about 4s. on last year's figures. Now, here is another extract from the "Iron and Coal Trades Review"—the official organ of the National Association of Colliery Managers. It is dated last Friday. They are rather put out about the Gaslight and Coke and South Metropolitan Companies, and they say: "At the present time, gas undertakings are face to face with a large rise in the price of gas coals." This is what the official organ of the National Association of Colliery Managers says. We are "face to face with a large rise in the price of gas coals." "And, what is equally important, the coalowners are, by reason of local associations of collieries, producing gas coals under excellent circumstances for taking advantage of the situation." The coalowners by that statement show they are combining to take advantage of the position; and this is said by their own organ. Well, then, they complain about me: "Sir George Livesey is crying before he is hurt, when he asks for a conference of gas companies and gas committees to discuss some common action for resisting the demands of the collieries supplying gas coals." Well, what are we to do? Are we to remain meekly sitting down and let them take all they choose from us? Certainly not, if we can help it. We must resist them in every possible way. Now, they make some mistakes. They say that we, the gas companies, are doing very well. "Nevertheless, the Gaslight and Coke Company show a balance of revenue over expenditure [over 1s. per 1000 cubic feet." Now they ought to be more careful, because the Gaslight and Coke Company show nothing of the kind, for their surplus on the half year is only one farthing per 1000 feet. Then they say: "The South Metropolitan Gas Company are distributing dividends at the rate of 5½ per cent. per annum to their shareholders. The fact is that gas manufacture is one of the most uniformly successful industries in the country, and it would be possible to supply customers at lower rates and still earn handsome dividends." Well, they are wrong. I do not blame them so much for that—about our dividend of 5½ per cent. We are nominally paying 5½ per cent. But it is thirty years ago last year since Parliament introduced the auction clauses; and all our new capital has been sold by auction. People buy it. We have just issued £100,000 of stock at 128. They take it at the market price, which yields them 4¼ per cent.; and that is all gas shareholders get. I do not know that I need trouble about any more of these things. There is the "Newcastle Daily Journal," with something of the same sort; but I think I have said enough on this point. I do not object to men getting good wages; but it is an extraordinary fact that whenever wages go up, the output of coal per man diminishes. I believe there are some coalowners who have great difficulty in making both ends meet. I am not going to say there are not some who have hard work to do that. One with whom we have done considerable business for many years said he could not supply us last year at the price of 8s. 3d. per ton, because he would be actually losing money; and I believe he was in that position. But why was it necessary to lose money? He told me that 10 per cent. of the men who hew the coal were absent constantly, and that after pay day 30 per cent. of them were absent—disorganizing everything. Supposing 30 per cent. of our workmen were absent after pay day, where would the gas supply be, and where should we be? A great deal of the extra cost of coal is due to this. The clamour for the eight hours' day is purely a Socialist demand, and is made for the purpose and object, as witness after witness admitted to the Labour Commission, of absorbing the unemployed; for they felt that if all the unemployed were absorbed, trade unions would really be masters of the situation. I put this question to witness after witness: "Supposing you got an eight hours day, and supposing there were still unemployed, what what you do then?" The reply was "Reduce to six hours." Mr. Tillett was one of the witnesses I put the question to; and again I asked: "Supposing you had a six hours day and you still had unemployed, what would you do then?" The answer was "I would reduce to four hours, and compel all the rich people to work as well as the poor."

PRICE OF COAL AND THE COMPANY'S DIVIDENDS.

Well, I think I have talked long enough on that subject. But this I will say, that if coal advances in price seriously, we shall be obliged to increase the price of gas. There is no doubt of that. We have struggled hard to keep it down to 2s. per 1000 cubic feet; but if the price of coal advances seriously, it must go up. I may say this to the shareholders—we have not paid full dividends, we have not earned full dividends, since we reduced the price in June, 1904. We have never paid the full dividend to which you are entitled—namely, £5 14s. 8d. per cent. You are entitled to 2s. 8d. per cent. for every penny of reduction in price below 3s. 1d., and 2s. 8d. per cent. on the 2s. price is £1 14s. 8d. added to the standard dividend of 4 per cent. Well we should not have paid that odd figure, but we should have paid £5 13s. 4d. Now, what does it come to? If we increase the price by 1d., there would be no reduction of dividend, and the 1d. would give us £52,000 a year. We should be entitled to £5 12s., and should pay £5 10s. If we increased the price by 2d., the dividend would be reduced to £5 9s. 4d. That is very near 5½ per cent., and there is no reason why we should not pay the £5 9s. 4d.; but it is a little extra trouble to calculate. If we increased the price by 3d., the dividend would have to come down to £5 6s. 8d.; so I think the shareholders may go away with the feeling that there is not likely to be any large reduction of dividend, even if the price of gas coal should be more than we expect. If the price of coal should go up 4s. a ton—though we do not believe it will be anything like that—that would mean about £700,000 more to be paid by the consumers of London, of which nearly a quarter-of-a-million would be our consumers' share.

THE QUESTION OF RATES.

There is one other matter of great importance—the question of rates. These have gone up 12 per cent. over the preceding year. There has been a reassessment; and we are engaged in an appeal. No ordinary article of common use that I am aware of pays anything like what the consumer of gas pays in rates. Seven per cent. of what he is paying for gas goes in rates. Whereas on ordinary trades—butchers, bakers, candlestick makers, and other common trades—the average rate is 1 per cent., on gas it is 7 per cent. A few years ago, it was 3½ per cent. Now it has got up to 7 per cent.; and we must do what we can to reduce it. The great increase of rates is due very largely to the extravagance of the people who spend the rates. They are idealists many of them; and it is rather a dangerous thing to have idealists with other people's money to deal with. The late Mr. Ruskin was an idealist; but he spent his own money. But with such idealists as those on the London County Council, it is the money of others that they risk and lose. One of the principal officers of an important London borough told me when we were talking about rates, that the cause of the high rates was the direct employment of labour; and he gave an instance. He said: "We have our Works Department, and do our own work. We can hire from respectable and responsible firms a horse, cart, and man, for less than 10s. a day; but the very lowest cost to the borough is 17s. a day, doing the work ourselves." And the same may be said of the London County Council. The latter boast a great deal of the profit they make on the Works Department. But how is it made? An officer of the Council specifies certain work and estimates that it ought to cost so much, and another officer of the Council does it for something under the sum his brother officer specified. The only test of an estimate is public competition. If an engineer or an architect or anybody makes an estimate, he is very likely to be mistaken; he may be too high or too low. But put it up to the test of competition, and you can ascertain what ought to be the price. The London County Council, however, do not do that. Their own officer estimates it, and their own officer does the work; and under these circumstances, of

course, the cost of the work may be expected to be below the estimate somehow or another.

THE QUESTION OF MUNICIPAL TRADING.

Then as to municipal trading, of course, I believe that is utterly and altogether wrong. I consider it is going in the direction of Socialism, and will be ruinous to the country. This is my well-considered opinion and belief. Practically the London County Council are prepared to undertake work of all kinds. They were rather angry with the Socialist leaders. Their Socialist wing was going rather too fast; but they themselves want to get an enormous electricity scheme and other businesses into their hands. Now, these gentlemen cannot manage these businesses. We know how difficult it is to get directors and men to manage joint-stock companies. The weakness of joint-stock companies is the difficulty of getting directors who understand the business and are capable men in every way, and suitable for the purpose of directing such businesses. The London County Council and the Borough Councils are not elected for their business capacity, but for other reasons—for their ideals, most likely. Now, what do they do? They appoint a Committee. The whole body is re-elected every three years; but I believe it is said to be in accordance with democratic principles that they must change every year, and their chairmen are changed every year. Whether a man is a good chairman or not, does not matter. He is in office for a year, and then another one takes his place. What would happen with a business and a company like ours if you changed your Directors and your Chairman constantly? A man is not long enough in office to get an interest in it or an understanding of it. Especially when you remember that the gentlemen are not elected for that purpose at all. There are schemes now for municipalizing everything. "The Times" of Jan. 31 had a long story about the London County Council; and they gave the programme of the Radical Federation in December, 1891, in which there were all sorts of things they proposed to do—among the rest to take over the plant, &c., of gas companies at a valuation. The programme of the Socialist Labour Party, recently issued, proposes to do all sorts of things—to take over the docks and the coal, the supply of milk, and the electric supply; but, as "The Times" says: "There is one remarkable omission, which deserves particular attention. No mention is made of the gas supply; it is quietly dropped out of the programme. Why? Simply because the workmen employed by the South Metropolitan Gas Company are shareholders in the concern; and the proposal to deprive them of their property would be resented. Only those things which belong to somebody else are to be municipalized for the benefit of 'Labour.'" Well, I do not think that is the only reason; but I think it is the South Metropolitan Company who have staved off the municipalization of the gas supply. What could the London County Council do? If they took over the gas supply they would have to equalize the price, and that equalization would mean an increase of price in South London by 6d.—from 2s. to 2s. 6d.; and I think that is a thing they are not prepared to face. They would never be allowed to charge two prices. They would have to equalize the price; and it is rather satisfactory to feel that the South Metropolitan Company have put a stop to that iniquity.

RELATIONS BETWEEN COMPANY, CONSUMERS, AND EMPLOYEES.

The only other paragraphs I have to refer to in the report are Nos. 5 and 6. In the former we say that the troubles and difficulties already referred to "are only temporary and will pass away or be overcome. On the other hand, the Company have two great sources of permanent satisfaction. The confidence and goodwill of the consumers has been gained by many years of fair and considerate treatment. This policy of the Directors has been loyally and sympathetically carried out by the Company's officers and workmen, who come in contact with, and therefore represent, the Company to the consumers; and its success is largely due to their co-operation." Well, that is a very satisfactory thing. Thirty years ago I said that the British public were right at heart, and that if they were fairly treated they would respond in the right spirit. I said that in 1874, when I was President of the British Association of Gas Managers; and I am here now, thirty-three years after, to say it is perfectly true. That is the policy we have tried to follow with our consumers. We have tried to carry out what the late Mr. Whiteley gave as one of the best axioms in all business: "Be honest." I think our consumers realize this. We are constantly receiving testimony from customers to the effect that they appreciate the way in which our people have now for many years treated them. The consumers appreciate it, and we have their good-will. Then as to the employees. President Roosevelt the other day, when the Nobel Peace Prize—a money prize of some £7000—was given to him, said he intended to devote it to the purpose of promoting industrial peace; and he used the words (I thank him for them): "Righteous peace in the industrial world, for righteous peace in the industrial world is as important as peace in the world of nations." Now, that is what we have been trying to do, ladies and gentlemen, in the world of our employees. In a paper sent to me the other day from America, I saw that another American, Mr. Carroll D. Wright, the head of the American Government Labour Department, said there had been all sorts of attempts made to reconcile capital and labour—conciliation boards, joint committees, collective bargaining, co-operation (I do not think he used the word "co-partnership"), profit-sharing, and the like—but he said we come back to the Decalogue; or rather he said—I put it in his own words—to Christ's words: "To love your neighbour as yourself, and do unto others as you would they should do unto you." That, I may say, is the effort of all of us. It is a high standard. We are trying to do that. It is our object and our desire to do to our workpeople as we would that they should do to us. We expect them to do the same in return; and I think I may say they also try to do so. We are trying to help them to help themselves. It is not increase of wages, it is not mere money, that is going to do the workpeople so much good, but it is in helping them to the ownership of property; and that is a thing we have succeeded in doing beyond expectation. Nobody had ever thought anything of the kind was possible. If I had been told, or if any man in England had been told, seventeen years ago, that in 1907 all the employees of the South Metropolitan Gas Company would be shareholders in the Company, and hold a considerable amount of stock, I should have said: "You are talking nonsense; it is utterly impossible—it is utterly incredible." But it is done; and if employers would so use their influence and their power to help their people to become owners of property, it would do a great deal to cure a large part of the social evils from which we suffer. The last paragraph of the report I need say nothing about, as you will have that presently. I conclude by moving: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. SIMPSON ROSTRON seconded the motion.

Mr. HOGARTH congratulated the Chairman on the splendid form he was exhibiting and his fighting courage. He also expressed satisfaction that the Board were determined to fight the rating question.

The motion was unanimously adopted.

THE DIVIDEND RESOLUTION.

The DEPUTY-CHAIRMAN (Mr. John Mews) moved: "That a dividend at the rate of 5½ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post."

Mr. J. A. BUTCHER (a Workman Director), in seconding the motion, assured the meeting that the workmen were animated by a desire to serve the Company. They had every confidence in the ability and integrity of the Directors, and it would not be their fault, as workmen, if prosperity were diverted from the concern. As the co-partnership system had been so successful, he was puzzled to know why it was not more extended.

The CHAIRMAN, in putting the resolution, said there need be no fear whatever as to the dividend of the next half year, as the current half year had begun well, and there were good increases; the June half year being also the better half.

The resolution was carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITOR.

The DEPUTY-CHAIRMAN: It is now my duty, and also a great personal pleasure to myself, to move the re-election of our Chairman upon the Board of this Company. Son of an officer of this Company, and born and brought up in the neighbourhood of one of the gas-works, he has always been endeavouring to find out all that could be found out about the manufacture of gas and the management of the business. In this he has been most successful. You all know he is a most able gas engineer; and, in addition to that, a most able man of business and a most generous administrator, as you have heard to-day from Mr. Butcher, who represents the men, and a most sincere friend of all here. Let me just very briefly tell you what, to my mind, are a few of the salient points of the history of this Company since he has had the management of its affairs. To begin with, the South Metropolitan Gas Company was comparatively small as compared with the Companies with which it amalgamated. First of all it amalgamated with the Surrey Consumers; then with the Phœnix, which was a rather larger Company; and then with two other Companies in Woolwich. It was, of course, a great thing to get the gas supply of the South of London into the hands of one Company, because that tended towards economy. Then the shareholders were divided into three classes, as possibly many of you remember, "A," "B," and "C." These classes of shareholders received different rates of dividends; and it struck the Chairman and others that it would be a good thing to range all these shareholders in one class. Possibly many of you will admit that difficulties that might have occurred had been entirely done away with by reason of the amalgamation of all those interests into one common ordinary stock. That, of course, is a great advance upon what had been before. Then, I think, I may say that this co-partnership has been one of the most remarkable things which has taken place, with the result of our seeing Workmen-Directors upon the Board. Another great advance has been the pushing of the incandescent gas-mantle, which has had an enormous effect on the industry, not only in London, but all over the world.

Sir FORTESCUE FLANNERY seconded the resolution, and referred to the services rendered by Sir George Livesey in respect of the removal of certain restrictions upon the gas industry in connection with the purification difficulty, and the saving of a large sum of money which gas companies had formerly to spend every year in unnecessary purification. It was very pleasing to hear the Workman Director testify to the affection with which Sir George Livesey was regarded by the workmen of the Company. He noticed that, although there were some 4000 of the workmen included in the profit-sharing scheme—they had not got them all—the number of employees being some 5000 in summer and 6000 in winter. He hoped that in the near future the efforts of Sir George Livesey and his colleagues, and of the workmen themselves, would result in every one of the permanent staff becoming a shareholder.

The DEPUTY-CHAIRMAN put the resolution, which was carried unanimously.

The CHAIRMAN: I thank you, Mr. Mews and Sir Fortescue Flannery, and this meeting, very warmly for this kind recognition of my services to the Company. It has occupied my business life; and I hope to be useful for some time longer. I should like to say one word about Sir Fortescue Flannery's remarks as to the discrepancy between the 4000 and 5000 shareholders. Nearly all the others are shareholders, but not in their own names. These 4000 hold the stock in their own names, but a large number have holdings in the names of trustees. They are shareholders all the same; but stock is not registered in their names. Mr. Bush tells me that all the regular men are shareholders. Now I have to propose a resolution myself: "That Mr. Robert Morton be re-elected a Director of this Company." Mr. Morton was for many years Engineer of one of the Woolwich Companies and of the Phœnix Company, also the London Company. Now he represents two of these Companies on the Board. Shortly after his retirement, we were fortunate enough to get him here, because men who have had practical experience in the management of gas-works are most necessary on the Board. Mr. Morton is a man whose sympathies are in the right place. He is thoroughly devoted to his work, and anxious to do all he can for the benefit of the Company, the consumers, and the employees.

The motion, having been seconded, was adopted.

Mr. MORTON briefly acknowledged his re-election.

Mr. GEORGE HOWLETT moved: "That Mr. Thomas Spooner Soden be re-elected an Auditor of this Company." He said Mr. Soden had been for many years Auditor of the Company. He had been tried and not found wanting, and they had confidence that, as in the past, he would carry out the duties to the entire satisfaction of the shareholders. He congratulated the Chairman upon the meeting. It had been somewhat querulously supposed that the price of gas would be put up in consequence of the increased price of coal. Like Sir George, he had had a good deal of experience of coalowners, who always seemed to be losing. He was reminded of a story of a wealthy manufacturer who promised a certain sum for the building of a free library in his parish. It was found it could not be built for the money. So he went to him again; but his answer was he could give no more, as he had lost money the previous year, by which he supposed he meant that his profits, instead of being £120,000, had only been £90,000. He thought the loss of the coalowners must be on somewhat the same scale. When times were booming, they piled up the money; and if the prosperous state of things was not perpetuated, they began to squeal. He did not believe the price of coal would be raised without a struggle; and he hoped they would be able to get on without raising the price of gas. Their present position was the fruition of years of magnificent effort, and it would be a sad thing to have to go back.

Mr. HOGARTH seconded the resolution, which was carried unanimously.

VOTES OF THANKS.

Mr. HOWLETT proposed a hearty vote of thanks to Sir George Livesey and the Directors. He said every man on the Board was of use, and there was no square peg in a round hole.

Sir FORTESCUE FLANNERY seconded the motion, and it was cordially adopted.

The CHAIRMAN: We, the Directors, thank you very warmly indeed for this expression of your confidence and goodwill. I have another motion to make; and that is to propose a vote of thanks to the officers and employees of the Company of all ranks. It would be very unjust to pass them over, seeing that so much depends upon them. With this vote I have to associate the name of Mr. Carpenter, our very able and very worthy Chief Engineer, and the name of Mr. Bush, our also very able and very worthy Secretary. These gentlemen represent the two departments of the works. Their hearts are in the work; they are thoroughly devoted to it; and they back up and support the Directors in the most loyal manner. Loyalty has not died out in England, as we can testify, with these gentlemen, and with those who are serving under them. I do not say that every employee is animated by the right spirit; but I do say that the great bulk and body of our employees are animated by the spirit of doing their best for the Company, and doing it heartily and well, with a due consideration of the interests of everybody else.

Mr. ROBERT MORTON seconded the resolution, which was carried unanimously.

Mr. CHARLES CARPENTER, in acknowledging the compliment, said the results of the year's working were as good a guide as they could have. During the last year, they had reached the highest point in respect of the amount of gas sold per ton of coal carbonized—the Company having actually sold 10,400 cubic feet of gas for every ton of coal, or about 1000 cubic feet more than were sold some seven years ago. This result had been effected with the lowest expenditure on record for carbonization—below 2s. per ton. The unaccounted-for gas was the measure of the care with which they looked over the more than 50 square miles of their district; and that item had not been lower for ten years. With regard to the question of purification, mentioned by Sir Fortescue Flannery, this was a subject to which, as they knew, Sir George Livesey had devoted many years of his life; and the result of the change had been that whereas for many years they were hampered by the disposal of many thousand tons of stinking, offensive material, last year nearly 5000 tons of sulphur extracted from the coal were sent down to the Company's residuals' works to be converted into sulphuric acid. In South London, where a good deal of money was being spent upon the construction of tramways, the streets were being opened, and the gas and water mains and telephone and electric pipes were being altered; and some two or three weeks previously, on a very dreary, drizzly day, he went over to see how the men were getting on. There were three different gangs at work. The first he came to were employed in road alterations, the second in altering water-pipes, and the third were the Company's own men. In the last gang there was not a single man with a straight back; and this he thought was very good indeed.

Mr. BUSH, in making acknowledgment for the secretarial staff, said they none of them liked deficits; and in the current half year they hoped the £9000 would be wiped off. The Company had been in almost exactly the same position with a deficit in December, and in the following half year they had cleared it off. In this respect he believed that history would repeat itself, for two reasons—one being that the Company had more favourable contracts for coke, and would be working with them during the whole of the half year; and the other because, under their present coal contracts they had a surplus amounting to between 80,000 and 100,000 tons. The report alluded to a slight falling off in the consumption of gas. This, no doubt, was due to the increasing employment of the incandescent light, which was being used by at least 80 per cent. of the ordinary consumers. Being curious to see the effect on the consumption, he had compared some 200 or 300 accounts of 1905, before people were using incandescent mantles, and of 1906, after they had adopted them; and he found that the reduction in the quantity of gas amounted to an average of upwards of 22 per cent.—the reductions ranging from 3 to 55 per cent. About 55 per cent. of the slot-meter consumers were using incandescent lights, the bulk of which had been fitted by themselves. The result had been a considerable reduction in the annual consumption of gas, representing 200 cubic feet per slot consumer; and if this were multiplied by 200,000 consumers they would arrive at a very large saving of gas. They were glad to know that this quantity had been saved. While these economical methods of lighting retarded consumption, they made consumers satisfied. In the long run, however, the Company would gain by this, because if the consumers were satisfied they would stick to the Company; and it was the Company's business, therefore, to satisfy the consumers.

The proceedings then closed.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting; and the report of the Directors and the statement of accounts were taken as read.

TRADE PROSPERITY AND FINANCIAL INFLUENCE.

The CHAIRMAN, in moving the adoption of the report and accounts, said: Gentlemen, the half year with which the report and accounts now submitted to you deal was undoubtedly one of great prosperity and commercial and industrial activity in almost all parts of the world. The consequent demand for money to meet trade requirements led to high rates for money in London, which is regarded as the free market for gold to the world; and you will see these high rates reflected in our accounts in two different ways. We had intended at the end of the year to make an issue of stock to reduce the balance overdrawn on our capital account, which balance has reached rather larger proportions than we are accustomed to see. But a 6 per cent. Bank rate ruling in London did not provide the public generally with much spare cash with which to make investments; and therefore, as prudent men, we thought it wiser to defer issuing stock until circumstances were more favourable. It was obviously, I think, wiser to borrow temporarily from our bankers, though we had to pay a little more for the money, than to issue stock at a lower price, and so create a higher permanent charge upon the Company. The second result grows out of the first—that we have paid a little more than usual for interest for our temporary borrowing from the bank. Otherwise, I am afraid that the prosperity to which I have alluded did not greatly affect our Company, except that the activity in the iron and steel trades, coupled with the removal of the export duty upon coal, has given an excuse to the coal owners to raise their prices. As you know, our district in the East-end of London—with its large foreign population, and its very high rates—is the last to feel the benefit of any increase in prosperity in the country; and when prosperity declines, it is the first to suffer.

CAPITAL EXPENDITURE AND INCREASING BUSINESS.

Still we have had a very satisfactory half year; and we are able to report to you a steady growth in the business, and an increase in the strength of the position which the Company holds. If you will turn to the capital account, you will see we spent £15,309 under that head—a smaller sum than we have spent for a good many half years past. All of it was used for the provision of new services, stoves, and meters; and therefore became remunerative directly the money was spent. We have completed the equipment of the retort-house at Stepney with stoking machinery and regenerative furnaces; and it is gratifying to know that the machinery which is used for the extraction of the coke from the retorts was invented by a member of the Company's staff—Mr. Ludbrook—who was for many years our Manager at Poplar, and is now in the Engineer's office at Stepney.* I am glad to say that the machine is thoroughly satisfactory in all respects. So far as I can see, there is no large capital outlay before us in the immediate future, except for the provision of coin meters and stoves; and therefore, we can look with equanimity at the rather large balance by which the account is overdrawn and wait with patience for a favourable opportunity for issuing stock, because we know, if necessity demands it, we can issue stock at any time. The £15,000 we spent enabled us to add 3010 stoves and 4647 coin meters in the half year. During the whole year we added 6782 stoves and 9744 coin meters. Our coin meter consumers now number 54,968, or more than double the consumers on the ordinary meter system. Of course, these coin meters bring us a very large volume of business, which we could not have obtained in any other way, for very few of these people would have used gas through ordinary meters. And I am happy to say that the demand for these prepayment meters does not show any sign of being exhausted. We still have a large field in front of us for the supply of these coin meters, and for cooking and heating stoves to be used with them. One of the advantages of the coin meters is that—except in the case of robberies (which are not very numerous)—we do not make bad debts. Another thing is these consumers take our gas equally in summer and winter, and principally in the day time when the other demand is lightest. I think a third advantage is that these meters broaden our basis of trade; and they bring us a class of consumer who is not likely to desert gas for any more expensive illuminant or fuel. The disadvantages are—First, that the rental is more expensive to collect, and, secondly, that the meters involve a considerable capital outlay. I should like to give one or two figures regarding our capital account, which I think shows that it is in a very satisfactory position. I remember, when I became a Director of this Company in 1888, I was told (I think it was by Mr. Henry Jones's father) that gas experts considered that an outlay of £400 of capital per million cubic feet of gas sold was a very moderate and satisfactory figure. I have always kept this figure in my mind as a standard by which to work, and which must not be exceeded. Let us see how far we have kept to the standard. In 1906, we sold altogether 3127 million cubic feet of gas; and we had expended on works and mains £1,172,566. That works out to £374 per million cubic feet of gas sold—considerably within the standard which was laid down so long ago as 1888. But we have also spent capital in the provision of coin meters, services, and steamships—an outlay which was not dreamed of in 1888. This brings our capital outlay to £442 per million cubic feet of gas sold—a moderate figure which is being reduced every half year. I would also remind you that we obtain special remuneration for coin meters,

* An illustrated description of the machine referred to appears in our "Register of Patents" columns to-day.—ED. J.G.L.

to cover interest and depreciation; and I would like to say, as I have said before, that the possession of our steamers saves us a very considerable sum every year in the carriage of coal from the North into the Thames.

POINTS OF INTEREST FROM THE REVENUE ACCOUNT.

Now, turning to the revenue account. Last half year we sold 1596 million cubic feet of gas, compared with 1541 cubic feet in the corresponding half of 1905. That is an increase of 55 million cubic feet; but it cost us only £942 more to manufacture this increased amount of gas, though we paid 1s. per ton more for our coal, which is equivalent to £5521. The saving is due, first of all, to better working, which is a very satisfactory feature. We have also saved £2466 in purification, owing to the removal of the penalties for sulphur compounds; and the item for repair and maintenance is also £5166 less. With regard to these two items, I would point out to you that, whatever saving we effect, the consumers get by far the largest benefit from it. If we are able to save so much that we can reduce the price of gas by 1d. per 1000 cubic feet, it means for the consumers £6457 in a half year; but it only entitles the proprietors to an extra dividend of £1428—that is, the consumers get four-and-a-half times as much as the proprietors. Then as to the repairs, the item is less—not that we have starved the works in any way. But in the last few half years we have spent more than usual on the upkeep of the works; and it is no longer necessary to spend so much—thanks to the ability that Mr. Henry Jones brought to bear upon the construction of the works, and the way the Engineer (Mr. Stanley H. Jones) keeps them up. The works are indeed in thoroughly good order. The only other item on this side of the revenue account to which I must draw your attention is that of rent rates, and taxes. It amounts to £13,184, as against £10,615 in the corresponding half of last year, or an increase of £2569. Of the increase, £2507 is due to additional rates, and only £62 to increased rent. One satisfactory thing I can say about the item is this, that I hope it will be down next half year. Our assessment in Stepney will be down in April; and the rates in Poplar have been reduced, I think, from 12s. to 11s. 8d. in the pound. This is not a very great reduction; but we have to be thankful for very small mercies. Usually we do not get mercies in this respect at all. Turning to the other side of the account, the 55 million cubic feet of gas sold in excess of that of the corresponding half of 1905 produced an extra rental of £5269. I generally give you the percentage increase. It was 3½ per cent. on the sale of the corresponding half year. I think that is a very satisfactory figure, and I believe you will also consider it so when I tell you the South Metropolitan Company had the slight decrease of nearly ½ per cent. on their sales, and the Gaslight and Coke Company had an increase of only just over 1 per cent. Then the rental from meters and stoves gave us £3262 more, and residuals £889 more—a disappointing result, so far as residuals are concerned. The price of coke did not rise proportionately to the price of coal; and all through the half year the markets for tar and sulphate of ammonia were very weak. However, in spite of the fact that residuals did not give us the help we anticipated, our profit was £64,526, compared with £61,030 in the corresponding half of 1905—that was an increase of £3496. I think that is a satisfactory result.

NET REVENUE ACCOUNT.

Turning to the net revenue account, we brought forward £19,409 from the June half year. The interest on the debenture stock and temporary loans amounted to £9463. We recommend to you the payment of a dividend of £5 4s. per cent. on the 4 per cent. stock and £5 per cent. on the 3½ per cent. stock, which is the same rate of dividend as we have paid the last seven half years. It will absorb £51,525, and leave a balance of undivided profit of £22,947 to carry forward to the current half year.

THE OUTLOOK.

As to the future. I certainly shall not commit myself to anything in the form of prophecy. But I can state certain facts, and leave you to draw your own conclusions from them. So far in the current half year we have had a very satisfactory increase in the sale of gas, amounting to nearly 6 per cent.; and two-thirds of the coal used during the half year will cost us the same as the coal used during the half year just concluded. Therefore, it looks as if we ought to have a favourable result to present to you when we meet, at the termination of the half year, in August next. Beyond that, it is very difficult to see. As you know, the recent cold weather and the somewhat large foreign demand for coal has enabled coal owners to put up the price of their commodity. And I am afraid there is no doubt they intend to ask higher prices when we enter upon the negotiations for our contracts for the coming year. As you know, asking does not always mean getting; and you may be quite sure we shall use every endeavour to moderate the coalowners' demands. At any rate, we have clearly before us that it is in the interests of all the partners in this concern—shareholders, consumers, and employees alike—to keep the price of gas as low as possible; and we shall strain every nerve to avoid the necessity of having to raise it. But if, unfortunately, we have to pay more for coal, it may be that we shall have to put up the price of gas. I hope, however, it will not be so; but, of course, our duty as Directors is to hold the balance equally between the consumers and the proprietors, and to do everything we can to foster our trade, and so increase the prosperity of the Company. I hope, however, that when we come before you this time next year, we shall have as good a report to present as we have to-day.

The Deputy-Chairman (Mr. Walter Hunter), in seconding the motion, remarked that it did seem suicidal on the part of the country to let coal go out to foreign countries, and to have taken off the export duty.

The motion was unanimously carried.

Proposed by the Chairman, and seconded by the Deputy-Chairman, a dividend at the rate of £5 4s. per cent. per annum on the 4 per cent. stock, and of 5 per cent. on the 3½ per cent. stock, both less income-tax, was declared.

On the motion of the Chairman, seconded by the Deputy-Chairman, Sir John Colomb, K.C.M.G., and Mr. J. G. Pilcher were returned to their seats at the Board. In submitting the proposition, the Chairman observed that he thought the proprietors all knew the services Sir John had rendered to the country and to the Company, and that they would agree with him the Company could not have a better Director. Mr. Pilcher, too, had been with the Company a long time. Excepting himself (the Chairman), he was now almost the oldest member of the Board; and his colleagues much valued his presence.

Proposed by Mr. Wilshaw, and seconded by Mr. Wilkins, the retiring Auditor (Mr. S. W. Savage) was re-appointed.

Mr. Arthur Haston moved a vote of thanks to the Chairman and Directors. Referring to the Chairman's remarks as to the possibility of an increase in the price of coal and gas, he said he hoped the other partners in the concern—the public—would bear in mind what the Company had done in the past, in carefully looking after their interests, by keeping the price of gas down to the lowest possible point.

Mr. M'Naught seconded the motion, which was heartily agreed to.

THE PRICE OF COAL AND THE WORKMEN.

The Chairman, in reply, remarked that the Chairman of another Board of Directors of a London Company, in his report to the proprietors, alluded to the anxieties and difficulties of gas directors. The Board had anxieties and difficulties in front of them; but they were not insuperable, if they brought care and determination to bear upon them. Certainly they were not intolerable when they had the support and sympathy of the proprietors. Proceeding, the Chairman moved a vote of thanks to the officers, their staffs, and the employees. He said he did this in no formal spirit, because he felt they deserved the thanks of the proprietors, for so much depended upon the energy they brought to bear upon their work. He could give the testimony, which would be supported by all his colleagues, that the work of the Company was well done, and willingly done. He thought one fact which supported that testimony was this, that their men were sought for by other companies. But he thought that the Company could do as well for their staff as any other Company; and he was glad when they made up their minds that the Commercial Gas Company was good enough for them. He had much pleasure also in saying that their relationship with their workmen was all they could desire. He never heard of any difficulties at all on the works; and he was happy to say the work was well done by the men. The Directors did all they could for them; and they had their sympathy, and, when they needed it, their help. But if, unfortunately, they had to pay more for coal, they would need all the support the workmen could give them, in order to pull them out of the difficulty, by better work and increased economy. The Duke of Wellington, shortly before the Battle of Waterloo, was talking to a member of his staff at his hotel window in Brussels, when the officer said, "Well, Sir, I do not see how we can resist the coming of Napoleon." Just then a private soldier crossed the court yard; and the Duke, pointing to him, said "that is the article that will do it." Now if he (the Chairman) were asked, "How are we going to get over the difficulty of the increased price of coal?" he would point to their workmen in the carbonizing houses, and say, "There are the men who have to do it."

The Deputy-Chairman seconded the motion; and it was cordially agreed to.

Mr. Ellis thanked the proprietors very heartily. It was, he said, gratifying to find that their services—such as they were, they were the best they could render—were so kindly received, and that the proprietors gave them credit for doing their best.

SUMMER AND WINTER INCREASES.

Mr. Stanley H. Jones also cordially acknowledged the vote. He remarked that, if he might supplement one point in the Chairman's address about the gratifying increase in the consumption of gas, it would be to tell the proprietors the nature of it. It would interest them to know that the growth of the consumption of gas in the Company's district during the summer months of the year was double what it was in the winter months. The rate of increase in the quantity of gas sold was double from about April to September to what it was between October and March. This was a very gratifying thing, because it enabled them to keep the plant and machinery in full work, and tended to economy. With regard to the Chairman's remarks about the price of coal, he could assure the proprietors that the Company's staff and workmen were particularly interested there; because if there were an increase in the price of gas, it would reduce the profit-sharing bonus. So far as the staff and workmen were concerned, anything they could do to meet a possible increase in the price of coal they would do.

BRENTFORD GAS COMPANY.

Accretion of Business.—Criticism by Mr. Trewby of the Company's Carbonizing Results.

The Half-Yearly Ordinary General Meeting of this Company was held on Friday, at the Westminster Palace Hotel—Mr. Howard Charles Ward in the chair.

The Secretary (Mr. William Mann) read the notice convening the meeting, and the Directors' report and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said the Directors had again to meet the proprietors with what he ventured to think, considering the circumstances of the half year—the influence of trade and atmospherical conditions—would be regarded as a very satisfactory financial statement. Weather had a great deal to do with the sale of gas; and during the six months ending with December, the average condition of the thermometer was 3 per cent. higher than had been the experience over a long period, and sometimes considerably more than 3 per cent. Nevertheless, the increase in the gas, meter, and stove receipts was £6506. If they took gas and meter rental alone, the increase was 3·23 per cent. In this connection, it was of interest to see how the business of the Company had grown. The ordinary consumers had increased from 29,392 in 1905 to 30,184 in 1906—an increase of 792, or 2·7 per cent.; while the prepayment consumers had increased from 30,277 to 35,139—an increase of 4862,

or 16 per cent. The number of ordinary stoves in use had increased from 21,287 to 23,420—an addition of 2133, or 10·02 per cent. The stoves installed in connection with the prepayment meter system had advanced from 20,922 to 23,374—an increase of 2452, or 11·7 per cent. It would interest the proprietors to learn that the inclination (upon which he had once before remarked) of the prepayment meters to show an average falling off in revenue had changed; and there was during the half year a decided increase in the consumption. This was a good thing, not only for the Company, but because it indicated, among other points, that the condition of the people who used the prepayment meters must generally be improving. The increases in connections showed what he thought might be claimed to be a tolerably satisfactory state of things. The half year had not been without anxiety for the Directors, owing to the attack made by a number of (he supposed they might be described as) speculators, who endeavoured to pass a measure in Parliament called the Outer Circle Railway Bill, which, had it received parliamentary assent, would have virtually destroyed useful parts of the Company's Southall station. It was, of course, necessary for the Directors to resist the Bill; and they did resist it to the utmost. By the aid of their Counsel and expert witnesses, the result was, in parliamentary parlance, that the preamble was declared "not proved." The sting of an attack of this kind was not all that remained. There were the expenses of the opposition; and the £1327 paid away for parliamentary charges in the half year was rather a large sum; and it would, had they not have had to defend their property, have gone to increasing the divisible profits for the half year. They had also, by reason of the doubtful blessings of municipal trading, and of the work of the County and Borough Councils, to pay an increased amount in rates of £1150. So that between parliamentary expenses and rates and taxes, they had an additional expenditure of £2478. The result of the half-year's business was that they had made a profit of £37,859; and they required for dividend £39,250. There was thus a deficit of £1391, which would be deducted from the undivided balance of £54,697. Regarding coal, this had risen very much in price; but their supply had not cost them much more. For the past half year, the cost had been 13s. 5·35d. per ton; and he was happy to say the Directors had had the foresight to cancel their former contract, and buy 200,000 tons of coal at an increased price, which virtually amounted to 14s. per ton. He believed the prices that were being quoted now were something like 16s. to 17s. per ton; and, therefore, they had undoubtedly made a good arrangement. The present contracts would certainly meet their needs until the end of 1907, if not longer.

Mr. TUCKETT asked what advance the 14s. was upon the previous contract.

The CHAIRMAN: 2s. 7d. Proceeding, he said the shareholders had no doubt observed that Sir George Livesey, in his address to the proprietors of the South Metropolitan Gas Company, had made some severe comments upon the increase that the coalowners were asking for gas coal. Regarding residuals, coke had given them an increase of £1928; but tar and ammoniacal liquor were rather less. Most of the other items in the accounts were very much on the usual level. After paying the dividend, they would have a balance of undivided profit of £53,305. The reserve fund now amounted to £31,354; and the insurance fund to £6426.

Mr. ULICK J. BURKE seconded the motion.

Mr. G. C. TREWBY said, as he had some criticisms to make, he ought perhaps to introduce himself to those who did not know him. He had been connected with gas all his working life; and as Chief Engineer to the Gaslight and Coke Company, he had introduced carburetted water-gas manufacture into this country. He was a shareholder in several gas companies; but his largest interest was in the Brentford Company. Therefore he had watched the progress of the Company with a very considerable amount of anxiety. For some years past, he had had an uncomfortable feeling that the quantity of gas derived from the coal had not been what it ought to have been. He would go back to the year 1890; and he found the Company then made 10,770 cubic feet of gas per ton of coal, and sold 10,173 cubic feet. This was before the introduction of carburetted water gas. Coming to the past half year, he had obtained the quantity of gas made from oil, and the number of gallons of oil used, and was therefore able to ascertain the number of cubic feet of oil gas and coal gas respectively made. He found that, instead of making as in 1890 10,770 cubic feet of gas per ton, there had been a drop to 10,275 cubic feet, and of gas sold to 9613 cubic feet, or a fall of 560 cubic feet per ton, or 5½ per cent. So that, while a great many of the companies supplying 14-candle gas had kept up their make per ton—in some cases to as much as over 11,000 cubic feet—this Company had shown a backward movement, notwithstanding that they had put up a carburetted water-gas plant for enrichment. He knew of three suburban companies, supplying 14-candle gas, measured by the No. 1 "London" argand burner, who in 1905 made an average of 11,226 cubic feet per ton, and who used 2 83 gallons of oil per 1000 cubic feet of gas.

Mr. R. J. NEVILLE NEVILLE: They have a better testing-burner.

Mr. TREWBY (continuing) said the Gaslight and Coke Company had to supply 16-candle power gas, as compared with the Brentford Company's 14 candles; and the respective results were as follows: The Gaslight and Coke Company made 10,846 cubic feet per ton of coal, and the Brentford 10,275 cubic feet; so that the Brentford Company made 571 cubic feet, or 5½ per cent., less per ton than the Gaslight and Coke Company. Take, too, the oil used. The Gaslight and Coke Company only used 2·9 gallons to enrich 1000 cubic feet of gas; the Brentford Company used 3·35 gallons, or 0·45 gallon (15½ per cent.) more. And the Brentford Company used 10·8 per cent. more enriching gas than the Gaslight and Coke Company, though making less gas per ton of coal. What did these figures all point to? With regard to the coal, they suggested one or other of these three things: First, the coal used was bad, and not worth the price paid for it; or, secondly, the carbonizing plant was bad, and not fitted to obtain the full results from the coal; or, thirdly, if the coal and plant were good, the plant was not being properly worked. Then with reference to the oil gas, which showed such a waste of material. It could not be said that the oil was bad, because the Company were using the same quality as the other companies; and therefore it resolved itself into either the apparatus being badly designed or improperly worked. To bring the matter to the basis of £ *s. d.*, what was the result compared with the Gaslight and Coke Company's working, which he had reason to believe was not yet the best that could be attained? The cost of the extra coal going to waste, working it out on the lines of the Gaslight and Coke Company's figures, was about £3000, without deducting residuals, or charging the cost of labour. That was to say, if they made the same quantity of gas from their coal as the Gaslight and Coke Company, they could save 4278 tons of coal. The cost of the extra oil used, amounting to 190,000 gallons, would amount, at 3d. per gallon, to (in round figures) £2400. This assumed that the Brentford Company were supplying their consumers with the same quality of gas as the Gaslight and Coke Company, which they knew was not the case, as the Brentford standard was 14 candles, and the Gaslight and Coke Company's 16 candles. Therefore, in order to institute a proper comparison, allowance must be made for this; and it was generally computed that the manufacturing cost of 2 candles was 1d. per 1000 cubic feet, and the selling price to the consumers was 2d. The 1d. per 1000 cubic feet equalled £5235; so that they arrived at a total amount, after allowing £2000 for residuals, of £8610. He was not in the least overstating the figure, but was rather understating it perhaps in allowing too much for residuals, and in not charging the cost of labour. But he thought he had said enough to show the Board and the proprietors what a serious matter this was from a financial point of view, more especially when the higher price of coal and, probably, oil was taken into consideration. He trusted, therefore, that the Board would without delay look into the matter with the view of remedying the state of things which existed, and stop the waste that was going on. He hoped, too, that the Board would take what he had said in a friendly spirit. He had no other object to serve than that the Company should be one of the best. They had also to take into consideration the fact that the parliamentary dividend had not been earned in the half year.

The CHAIRMAN pointed out that had it not been for the extraordinary parliamentary expenses and the extra charges for rates, the parliamentary dividend would have been more than earned.

Mr. TREWBY said he presumed they would continue to have to pay rates on the present scale.

The CHAIRMAN hoped that the ratepayers would see the folly of allowing wasteful expenditure, and that things would be changed.

Mr. TREWBY said his remarks applied to the waste disclosed by the carbonization returns. The Company were not now making so much gas per ton of coal, and yet they were using such an enormous quantity of oil. The matter was certainly one for explanation. One other remark he had to make was this. The Gaslight and Coke Company, in their accounts, put down the number of gallons of oil used each half year, and the quantity of gas made from it. Was there any objection to this being done in the case of the Brentford Company?

The CHAIRMAN: None whatever.

Mr. A. W. OKE supported the report. In the course of his remarks, he said that the Company's shares stood very well in the market. He could not help thinking the comparison made by the last speaker was somewhat unfortunate. He had compared a large Company with a much smaller one. He had given no information as to character and variety and prices of the coals used by the Gaslight and Coke Company, nor of the kind of oil they used, nor did he have regard to the differences in the testing-burners employed. However, he could not help thinking Mr. Trewby's experience in these matters might be usefully embodied in suggestions to the Directors, and if there was anything lacking in past working, they would do their best to remedy it. He could not, however, see that indifferent working was shown very largely in the results. The proprietors got good dividends, the price of gas was reasonable, and the Board had taken care to provide against the rise in coal (which had been increasing week by week) by securing supplies, at the price they had been paying, sufficient until the end of this year.

Mr. PFUNGST was quite sure there was something deficient in the management of the Company. The increased receipts were swallowed up by increased expenses. They had a magnificent field for carrying on their business, as was seen by the number of new houses and the continual increase in the sale of gas. But what was the use of it all if there was no net result from it? The parliamentary expenses only accounted for £500 more than in the corresponding half year. As to the rates, he presumed the Board had taken steps to appeal against their re-assessment in connection with the quinquennial revaluations. The Gaslight and Coke Company had obtained some reduction. The Governor also stated at the Gaslight meeting that the bye-products had realized more money. Apparently, the Brentford Gas Company had obtained less for theirs. He could not help feeling there was some want of business activity on the part of the Board or their officers.

Mr. J. CORBEN, prefacing his remarks by saying the proprietors had great regard for the Chairman and complete confidence in the Board, pointed out that they went on for some years contented with a 12 per cent. dividend, and there was not a sign of any dissent among them. Then the dividend rose to 12½ per cent. An adverse time now appeared to be commencing; and it was a time when there was no doubt a great deal of watchfulness and economy would be required on the part of the Board and their officers, to keep matters near about level. He was Chairman of a Company that could not be mentioned in comparison with the Brentford Company. Nevertheless, they worked on much the same lines. They used carburetted water gas, and nearly the same coals. He quite agreed with Mr. Trewby that they ought to have the quantity of oil used, and the production of gas from it, stated in the accounts. The Chairman had not touched upon the question of oil; but he (Mr. Corben) had looked upon it as a serious matter during the past eighteen months or two years. Oil had advanced in price very much; and in the case of the Company to which he referred, it had made as much difference to them as the advance that had taken place in the price of coal. Three years ago, they were buying oil at 2½d. a gallon; at the present time, they were paying 3d. He did not know what the Brentford Company were paying.

Mr. FRANK MORRIS: 3⅜d. delivered.

Mr. CORBEN (proceeding) said the increased price made a difference of from 2d. to 2½d. (he believed it was) per 1000 cubic feet. So far as he understood the matter, he agreed that the amount of oil used by the

Brentford Company per 1000 cubic feet of gas was extravagant; and he also agreed that the amount of gas made per ton of coal was not of the quantity which could compete with the production from modern systems of manufacture elsewhere. He was only making these remarks with the view of urging the Directors and their officers—the Engineer particularly—to pay very great attention to carbonizing expenses and results, and to endeavour to do something better than during the past twelve months. He was quite aware of the disparity in the size of the Gaslight and Coke Company and the Brentford. He admitted, too, that the Gaslight and Coke Company had an advantage in their modern machinery, and the vast quantity of coal they carbonized; but the Brentford Company had a corresponding advantage in illuminating power.

Mr. BURKE: We have a considerable disadvantage in our testing-burner.

Mr. NEVILLE: We have to use Letheby's 15-hole argand burner; and we are bound to supply what is practically a 16-candle gas.

Mr. MORRIS: If you like to go for the low standards, we could do 11,000 cubic feet per ton.

Mr. CORBEN: I hope you will try to alter that.

Mr. NEVILLE: The difficulty is if we go for the Carpenter burner, everything will have to go into the melting-pot.

Mr. MORRIS: We have applied to the Board of Trade; but there has not been any settlement yet.

Mr. TUCKETT asked whether, in view of the rise in the price of coal and oil, the Directors were anticipating any upward movement of residuals.

The CHAIRMAN said it was impossible to do that. But he should like to say, regarding the effect of atmospheric conditions on their business, that, owing to the cold weather since the beginning of the year, they had an increase of about 9 per cent. compared with the same time last year. They had also sold household coke at a much better price.

Mr. BURKE: It is not always a question as to the actual price you can charge for coke; sometimes, according to production and stocks, it is a question whether it is desirable to raise the price.

The CHAIRMAN also pointed out that the Board had put an extra £2000 to depreciation of meters.

Mr. MORRIS: You will not find any other Company of this size who have written off capital account £15,000 for depreciation out of the profits of the half year.

Mr. NEVILLE expressed the opinion that Mr. Trewby might have given the Board a little more time.

Mr. TREWBY said he sent a second letter, giving to the Chairman the figures three days before the meeting; and the Chairman had not seen fit to refer to them or to the subject.

The CHAIRMAN said he had not seen the figures, as he had been from home. He added that the capital used per 1000 cubic feet was regarded as a good indication of the working of a Company. This time last year it was 9s. 11d. per 1000 cubic feet; and it was 9s. 7d.

Mr. HUGHES expressed the opinion that it would have been better if the details of Mr. Trewby's criticism had not been made public.

Mr. PFUNGST asked whether any steps had been taken to fight the assessments.

The CHAIRMAN: The matter was put into the hands of skilled men, and the assessments were reduced.

The report having been adopted, dividends were declared at the rates per annum of 5 per cent. on the preference stock, 12½ per cent. on the consolidated stock, and 9½ per cent. on the new (1881) stock—all subject to income-tax. Succeeding, a resolution was passed re-electing to the Board Mr. Howard C. Ward, Mr. Ulick J. Burke, and Mr. R. J. Neville Neville. The retiring Auditors (Mr. Monier F. Monier-Williams and Mr. Alfred Bevis) were also re-appointed.

Mr. CORBEN moved a vote of thanks to the Chairman and Directors, and asked them to disabuse their minds that the criticism that day regarding the working was intended as a reflection upon them. They met there as fellow-proprietors; and it was an opportune time to ask questions and to comment upon results. The criticism had been made in a friendly way, with the desire to produce improvement.

Mr. TREWBY seconded the motion, which was agreed to.

The CHAIRMAN, in acknowledging the vote, said he regretted there had been any differences about these matters. But he thought the questions raised were scientific ones, which should be discussed with the officers of the Company.

The proceedings, which had extended to an unprecedented length for the Company, then terminated.

WANDSWORTH AND PUTNEY GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Company's Office, Fairfield Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Charles W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said he had great pleasure in moving the adoption of the report and accounts, and in dealing with their main features so as, if he could, to assist the proprietors' appreciation of the condition of the Company. They had sold for the first time in their history a quantity of gas which made the sale for the whole year 12 million cubic feet over 1000 millions, which was a stage in their record. Every million cubic feet of gas represented 100 tons of coal; and, therefore, 1012 million cubic feet of gas meant that they had used the equivalent of 101,200 tons of coal. In the half year, the extra sale had been equal to 4·05 per cent., which was rather a record among neighbouring companies, because of the fine autumn. Every one of the neighbouring gas companies whose accounts were to hand—the Brentford, his own old Company (the Commercial), the Gaslight and Coke Company, and the South Metropolitan Company—showed that, in respect of the percentage increase in the consumption of gas, the Wandsworth Company had during the past six months topped the record. It was not his practice to quote figures of other companies, especially of those who had not yet held meetings, and therefore he only told the proprietors this in general terms. Now they had also added to their consumers very nearly 1000 in the half year—928 to be exact, of whom 243 were ordinary consumers, and 685 (or as nearly as possible three times the number of ordinary ones) were prepayment consumers. The Company had also increased the number of stoves let out by 972, which showed that not only did all the new consumers take stoves, but some of the older customers were converted to their use. The proprietors would have noticed that the profit shown on the face of the accounts was rather less than last year. In the corresponding period of 1905, it was £13,075; and on this occasion, it was £12,563. The Board were not disheartened about this, because it would be remembered that they had the courage to reduce the price of gas last year by 2d. per 1000 cubic feet, and their Secretary had told him that this meant on the sale of gas in the half year no less a concession than £3616. It would be seen at once that if they had kept the price of gas up, this £3616 must have meant a large additional profit. They could not surrender this sum to the consumer unless they made some great improvement in manufacture and got a considerable development in their business; and therefore it was a great satisfaction to him to say that the concession of £3616 had only resulted in a net loss of profit of about £512. What did the £3616 mean, when it came to be compared with the extra dividend paid for the past year, because the Board had manfully faced the privilege granted by the statute of raising the dividend when they lowered the price of gas. Therefore the dividend which would be paid to the proprietors that day would be calculated at the full statutory rate, corresponding with the reduced price of gas. But the amount that would be distributed among the proprietors was only £422, against the £3616 that the consumers would get; so that out of any improvement, any saving or economy the Company could effect, the consumers took nine parts and the proprietors only one. The reason why the proprietors' proportion was so small in this Company was because of the great economy with which their capital had been spent; and the dividend was a comparatively small charge upon the gas—being about 6½d., whereas in many companies, it was as much as 1s. 6d. The capital being small, it took a small amount of extra profit to give the proprietors the additional dividend due to the reduction in the price of gas. Therefore, under similar circumstances, where low gas capital accounts were well administered, the proprietors' share in the "plunder" (if he might so call it) was always minute compared with the consumers' share. The proprietors were aware the Company professed to sell gas at 2s. per 1000 cubic feet; but owing to the fact that they had a large number of manufacturers in the district who got a reduction, the Company did not realize 2s. per 1000 cubic feet. When they allowed for discount, they obtained something like 1s. 11d. per 1000 cubic feet. So that he thought the proprietors would be satisfied that their Company were supplying an article that was manufactured about as reasonably as in the case of any company in London or the south of England. In arriving at this profit, he might say they had spent a little more on coal and oil—a mere fraction worked out to per 1000 cubic feet of gas made. In this connection, it might interest the proprietors to know that the Company now brought their coal by steamer direct from Newcastle, and unloaded it in the river opposite the works, where they had floating stores. As to the residuals, they had realized a rather larger sum from coke; and the other residuals were about the same, except that sulphate had not been quite so good. The other charges, too, were on much the same footing as in the corresponding half year of 1905; and, in fact, when a Company had been worked up to what the officers and the Directors called "agony point," there was not much room for variation in the charges, because they had largely exhausted their opportunities for improvements. The proprietors had therefore a strong whip hand on their officers and Directors in the knowledge that any extravagance upon such small figures would leave no margin, and the proprietors would at once suffer in their dividends. The total cost of gas, after deducting residuals, was just under 23d. as against 24⅕d. in the corresponding period of the previous year. The receipts from gas, owing to the reduction, had come down from 31d. to 29d. But this included the rental of meters, stoves, and coin fittings; so that the actual cost of gas was under 2s. This left the Company a profit of rather less than 6½d., as against 7d. in the corresponding period of 1905. The consequence was that on this occasion they had not quite earned their statutory dividend (which required £13,183) by the sum of £619, which was, roughly, equal to ½d. But the Directors did not hesitate to recommend this dividend, because they carried forward a small balance from previous years. He ventured to think that, in a half year in which they gave up to their consumers nearly £4000, or nearly £8000 in the year, the proprietors would consider it not undeserving of their satisfaction that the Company had actually earned within close upon £600 of the dividend which, under the statute, was the very largest they could possibly offer the proprietors. He could assure them that, on all points, their affairs were vigilantly watched by the Directors and officials alike.

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell) seconded the motion, which was unanimously carried.

The CHAIRMAN next moved that dividends be declared at the following rates per annum: On the "A" consolidated stock 8 per cent., on the "B" consolidated stock £6 10s. per cent., and on the ordinary "C" stock £5 12s. per cent. It would be remembered that, under the consolidation and conversion of the capital, the proprietors' holdings duplicated their original amounts of stocks, and that the dividends now proposed were exactly those due to the proprietors under the Act, in view of the last reduction in the price of gas.

The DEPUTY-CHAIRMAN seconded the motion, which was agreed to.

Proposed by the CHAIRMAN, and seconded by Mr. H. S. FREEMAN, the retiring Directors (Mr. E. R. Ransome and Mr. J. Bromley Howell) were unanimously re-elected; and both gentlemen duly acknowledged the continued confidence of the proprietors. It was mentioned by the Chairman that Mr. Ransome had been a Director 36 years.

Proposed by Mr. J. TURTON WRIGHT, Mr. John Hennell was replaced in the auditorship.

Moved by Mr. J. C. BADCOCK, C.B., and seconded by Mr. J. TURTON WRIGHT, a hearty vote of thanks was passed to the Chairman and Directors and the officers, for the satisfactory way in which the Company's business had been managed during the half year.

The CHAIRMAN responded; and, referring to the officers, he said that

no company could have a better Secretary than Mr. Braine, and their Engineer (Mr. H. O. Carr) would not be left behind even by the Secretary in winning the praise of the Directors and proprietors in years to come.

Mr. Braine and Mr. Carr both expressed their acknowledgments on behalf of themselves, their staffs, and the workmen.

The proceedings then terminated.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be submitted by the Directors of this Company at the ordinary half-yearly meeting next Friday, they state that the sales of gas during the six months ending Dec. 31 last show an increase of 6·67 per cent. over those in the corresponding period of 1905; while the number of consumers and of stoves on hire rose by 1014 and 789 respectively. During the half year, the equipment of the new stove and meter repairing shops at Waddon was completed; and considerable progress has been made with the erection of an entirely new section of scrubbing, washing, and purifying plant. The new show-room and the additions to the chief offices have also been completed. The accounts accompanying the report show that the balance of net revenue available for distribution is £24,838; and the Directors recommend dividends at the rates of 14½, 11½, 10¾, 10, and 5 per cent. per annum (all less income-tax) on the several classes of stock. The payment of these will absorb £20,378; leaving a balance of £4460 to be carried forward.

The working statements show that 38,980 tons of coal as well as 471,529 gallons of oil were employed in the production of 621,842,700 cubic feet of gas, of which 568,699,200 cubic feet were sold and 575,844,500 cubic feet were accounted for. The estimated quantities of residuals produced were: Coke, 23,388 tons; breeze, 4858 tons; tar, 501,742 gallons; ammoniacal liquor, 943,156 gallons—the quantity of sulphate made being 378 tons.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report on the working of the Company in the half year ending Dec. 31, which will be presented to the proprietors next Friday.

The reduction in the price of gas from June last, concurrent as it was with a considerable increase in the cost of coal, has had a result that was not unexpected—viz., a deficiency on the working of the half year of £1884 18s. 6d., as shown in the net revenue account; £3711 2s. 11d. is brought forward, and £1826 4s. 5d. will be carried forward to the next half year.

Under these circumstances, and with the possibility of a further increase in the price of coal, the Directors do not recommend the payment of the full dividend of 5¾, or £5 13s. 4d., per cent. to which the shareholders are entitled under the sliding-scale when gas is sold at 2s. 5d. per 1000 cubic feet. They have, however, no hesitation in recommending the same dividend as the last—viz., at the rate of 5½ per cent. per annum.

Reverting to the question of coal, there is a report that a body of Midland gas coal owners agreed in conference to put up the price of gas coal 2s. 6d. per ton. The only proper answer to this action is for the buyers of that coal (it is to be hoped there will be none in the market for some time) to refuse to take it at such an advance. The suggested increase of 2s. 6d. per ton on coal would mean 3d. per 1000 cubic feet rise in the price of gas. To raise the price of gas would be very injurious to the gas industry; and the Directors will certainly do everything in their power to avoid such a misfortune.

The new conditions under which the Company supply gas, which they have been four years in obtaining piecemeal, have now been in full operation since June last. They appear to have given general satisfaction; neither consumers nor local authorities, nor the inhabitants of the neighbourhood of the gas-works, making any complaints of the altered conditions. This is the ultimate justification of the determination of the Directors to carry the fight to a finish, though it needed four consecutive applications to Parliament, and cost the Company quite £10,000, and, according to a statement in the "Journal of Gas Lighting" of Jan. 22, cost the Local Authorities £2662 in futile and mischievous opposition—a sheer waste of some £13,000, proved by the fact that Parliament has actually granted to the Company somewhat more than they originally asked. The Directors are glad to add that it was the fairness of the Beckenham Local Authorities that materially helped the final settlement, for without their action it is possible there would have been another Bill this year. If so, the price of gas would not have been reduced, and the present satisfactory relations with all the Local Authorities would have been only a matter of hope.

It is satisfactory to note that the consumers take a practical interest in the affairs of the Company, as, since the last half-yearly meeting, £30,000 of the ordinary 5 per cent. stock was offered to them, at £124 per cent., and the whole of this amount has been taken up.

The working in the manufacturing part, under Mr. Shoubridge, and in the office and secretarial department, under Mr. Obren, efficiently and willingly aided as they have been by the heads of departments and the staff generally, has been constantly improving; and there is no doubt those devoted officers and their assistants would say they hope still to improve the working of the Company generally. They would also join the Directors in saying that their efforts are most heartily and loyally supported by the great body of workmen of all ranks and classes, who, being shareholders, both officers and workmen, take a real interest as proprietors in the Company with which no other interest can be compared.

Two Directors (Sir George Livesey and Mr. Charles Hunt) and one Auditor (Mr. Thomas Guyatt) retire from office at this meeting. They are all eligible, and offer themselves for re-election.

The accounts accompanying the report show that the revenue from the sale of gas in the past half year was £79,814; from meter and stove rents, £5968; and from residuals, £26,536. The total receipts were £112,374. The expenditure on the manufacture of gas was £69,770; on distribution, £10,867; and on management, £4945—the total expenses amounting to £93,461. The balance carried to the net revenue account is £18,913; and the amount applicable for dividend, £19,413. The working statements show that 66,089 tons of coal were carbonized in the half year, and that 733,547,000 cubic feet of gas were made, of which 660,760,000 cubic feet were sold and 670,584,000 cubic feet accounted for. The residuals produced were: Coke, 793,068 cwt.; breeze, 15,746 yards; tar, 688,423 gallons; and ammoniacal liquor, 15,331 butts—the quantity of sulphate made being 619 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

The report which the Directors of the Tottenham Company will present to the shareholders on Saturday opens with the gratifying statement that the growth of business continues to be satisfactory. The sales of gas show an increase, in the six months ending December last, over the corresponding period of 1905, of 54,749,040 cubic feet, or 9·8 per cent.; the number of consumers has been augmented by 4370; and 1629 additional cooking-stoves are in use. The Directors are of opinion that the position of the Company's finances justifies a further reduction in the price of gas; and they have accordingly decided to lower it 2d. per 1000 cubic feet from the reading of the indices of the meters at the last Christmas quarter—making it 2s. 6d. The net profit for the half year, after providing for interest charges and carrying £1000 to the insurance fund, is £15,172. Adding £19,088 the balance previously accumulated in the net revenue account, the sum available for distribution is £34,260. The Directors recommend the payment of dividends at the rates of 6½ per cent. per annum on the "A" stock, and 5 per cent. on the "B" stock, which will absorb £13,007, and leave £21,253 to be carried forward. The Directors record that Mr. James Randall has resigned his position as Secretary of the Company, after 54 years of service; and, under the authority given in the Act of last year, they invited him to join the Board. The proprietors will be asked to sanction a retiring annuity to Mr. Randall, to confirm his election as a Director, and to add to the allowance to the Directors accordingly. The Assistant-Secretary (Mr. E. Topley) has been appointed Secretary; and a resolution will be submitted to the proprietors fixing his remuneration.

The accounts accompanying the report show that a sum of £26,370 was expended for capital purposes in the six months to which they relate; £11,611 of it being for new land which the Company had been authorized to acquire. There is a debit balance of £12,185 on this account; but the shareholders are to be asked to authorize the Directors to exercise certain powers to raise capital conferred by the Act of last year. The revenue from the sale of gas amounted to £81,951; meter and stove rents and the maintenance of incandescent mantles produced £10,999; residuals realized £12,892; and the total revenue amounted to £105,855. The expenditure on the manufacture of gas was £56,359; on distribution, £16,986; and on management, £4205—the total expenses being £86,671. The balance carried to the profit and loss account is consequently £19,184. The working statements show that 31,319 tons of coal and 706,723 gallons of enriching oils were employed in the production of 665,931,000 cubic feet of gas, of which 613,152,000 cubic feet were sold and 623,606,000 cubic feet accounted for. The estimated quantities of residuals produced were: Coke, 18,791 tons; breeze, 2980½ chaldrons; tar, 386,450 gallons; and ammoniacal liquor, 8700 butts—the make of sulphate of ammonia being 219 tons 7 cwt.

FURTHER REDUCTION IN PRICE AT SHEFFIELD.

The Directors of the Sheffield United Gaslight Company announce, with considerable satisfaction, that they have decided to reduce the price of gas by 1d. per 1000 cubic feet from the dates of the reading of the meter-indices for the March accounts. This reduction amounts to about 6 per cent. to the ordinary consumers, and 8 per cent. on the gas supplied to the Corporation for public lighting and to users of gas-engines. The charges will then be 1s. 4d., 1s. 2d., and 1s. per 1000 cubic feet, according to consumption; and 1s. per 1000 cubic feet for engines. The charge for the public lamps from the 1st of April will be at the rate of 1s. per 1000 cubic feet. The average price at which gas has been supplied by the Company during the past half year is 1s. 4·06d. per 1000 cubic feet. In addition to this gratifying announcement, the report to be submitted at the meeting on the 11th prox. states that the fact that the advantage of a cheap supply of gas is appreciated by the consumers is shown by its increased use for all the purposes for which it is pre-eminently suited—lighting, cooking, heating, and also for power. The additional quantity sold during the six months to Dec. 31 was 84,424,000 cubic feet, or 5·64 per cent. There is a profit on the half-year's working of £10,603 more than is required to pay the dividends.

Increased Sale of Gas at St. Austell.—A very successful year's trading is recorded in the annual report of the St. Austell Gas Company. There was an increase of 64 in the number of consumers, and of 6½ per cent. in the sale of gas. The Directors recommend the payment of a dividend of 8½ per cent., and remark that this is a subject for congratulation, in view of the advance in the price of metals and the increased competition with the Company. The revenue of the year was £5406, and the expenditure £4687.

PROVINCIAL GAS COMPANIES.

Extended Operations at Derby.

The Directors of the Derby Gas Company had an excellent report to present to the shareholders at the annual general meeting last Friday. The profit on the past year's working amounted to £30,006, and the gross profit was £30,047. After deducting the interim dividend and the interest on the debenture stock and deposits, there was left a balance of £17,626; and this, with the balance of £9777 brought forward, gave a total sum of £27,403 available for distribution. The Directors recommended the payment of the standard dividend on the consolidated stock at the rate of 5 per cent. per annum for the half year ending Dec. 31, with an additional ½ per cent. for the whole year, making 5½ per cent. The Directors stated that the purchase of the undertakings of the Spondon, Ockbrook, and Borrowash Gas Company, Limited, and the Mickleover and Etwall Gas Company, Limited, had been completed, and trunk mains were being laid to enable the new districts to be supplied with gas direct from the Derby works. There had been a very satisfactory increase in the sale of gas; and the Directors, in order to further extend and encourage its use, had made considerable reductions in their scale of charges from the last June quarter. In moving the adoption of the report, the Chairman (Colonel Gascoyne, J.P.) remarked that though this year was the Centenary of Gas Lighting in London, and the Derby Gas Company could not boast quite 100 years of existence, he might congratulate the proprietors upon 87 years of varying fortunes, but latterly of continued prosperity. The report before them contained the announcement that the neighbouring small works of the Etwall and Spondon Gas Companies had been purchased; and they were incorporated with their own on the 1st of January. Towards the close of last year, the Directors entered into a contract, extending over a term of years, to supply the Midland Railway Company with a large quantity of gas in bulk. Turning to the accounts, the Chairman said one of the items of expenditure on capital had been £2843 for new mains and services, the bulk of which was for the new high-pressure main to Mickleover, it being their intention shortly to close the Etwall works, and supply all that district from the Derby works. During the year they had laid 4 miles 171 yards of new mains, besides relaying 333 yards of larger mains in substitution of inadequate ones. New meters had cost £2829, and new gas-fires and cooking-stoves £4810; but from this must be deducted the depreciation on all those in present use, leaving the balance to be charged to capital. It might be interesting to mention that there were no less than 11,145 gas cooking-stoves and fires out on hire or sold to customers, all supplied and fixed by the Company, besides a considerable number which had been bought privately and fixed by local gas-fitters. The total expenditure for capital purposes was £7888. Then, of course, the additional sum of £18,100, being the purchase price of the two new Companies, came into capital account in the balance-sheet; but it was all taken in stock of their Company. The chief item on the expenditure side of the revenue account was always coal. For this they had paid £27,174; being a decrease of £350 from the previous year, due to their having bought at a somewhat cheaper price. The number of tons carbonized was practically the same—roughly speaking, 60,000 tons. The expenses of carbonizing in 1905 were £9404; but last year, notwithstanding that there was an increase of 4 per cent. in the quantity of gas sold, the carbonizing had cost only £8973—a saving of £431. This, added to the saving on the coal, gave a total advantage of nearly £800, though they had sold so much more gas. He would also say that in 1905 the quantity of gas sold per ton of coal used was 10,000 cubic feet, whereas during 1906 it was 10,300 cubic feet. All these facts indicated the superiority of modern methods of working and the value of labour-saving machinery, which had been introduced by their Engineer (Mr. J. Ferguson Bell, M.Inst.C.E.), with whose valuable advice and co-operation the Directors hoped to effect still further economies. Having dealt with other items of expenditure, the Chairman explained that the sum for repairing and renewing meters was a considerable increase on 1905, due to a great number of the ordinary kind being replaced by prepayment meters, of which they had now upwards of 11,000 in use. On the receipts side of the revenue account, the quantity of gas sold during the year was shown to be 609½ million cubic feet, which was an increase of 24 millions. The revenue from the sale of gas was £75,513; being an increase of £2654, notwithstanding the substantial concessions in price which came into operation on the 1st of July last. In the large increase in the gas sold, the development of gas-engines played a most important part. With regard to residuals, the prices obtained for them had, on the whole, been lower than in 1905; but, fortunately, by the economies effected in manufacture, the actual returns had been increased. The total receipts amounted to £100,731; and the profit on the year was £30,006, or £1000 less than it was for 1905, owing to the large expenditure to which attention had been drawn. The reserve fund stood at £30,000; and it was automatically increasing by the addition of its own interest. In conclusion, the Chairman said he thought the Company never stood in a sounder financial position; and he believed the shareholders might look forward with confidence to the future. Alderman Newbold, in seconding the motion, pointed out that this was the first occasion in the annals of the Company when the annual revenue had reached £100,000; and he said this result was achieved in face of the competition they had to encounter from the electric light—a competition which, however, they did not fear, because they were firmly convinced that they could supply the public with a superior light at much less cost. The motion was carried. The dividend recommended having been declared, the retiring Directors were re-elected. One was Sir Henry Bemrose, who, in acknowledging the continued confidence of the proprietors, said the Company had a body of officers second to none. They claimed to be progressives—not on London County Council lines—but on Derby Gas Company lines. The whole of the Board took extreme pleasure in being able to manage the affairs of the Company to the satisfaction and benefit of the town. The meeting voted an increase in the fees of the Directors, and their thanks were accorded to the Chairman, his colleagues on the Board, the Engineer, Secretary (Mr. H. Bullivant), and staff, and acknowledged by the Chairman and the Engineer.

Alluding to the price of coal, Mr. Bell mentioned that for a number of years coal had been too cheap, and the collieries had not obtained sufficient for their product. Now, he was afraid, there was a tendency to go to the other extreme. A few years ago the Company used to be satisfied with 50 per cent. on the value of the coal as the return for residual products; but last year they obtained almost 80 per cent. of its cost.

Breaking Records at Scarborough.

The report and accounts for the year ending Dec. 31, which were presented at the meeting of the Scarborough Gas Company on the 9th inst., were of a highly satisfactory character. There was an increase of about 9½ million cubic feet in the quantity of gas sold; and although the price was reduced in April by 1d. per 1000 cubic feet in the town and 3d. per 1000 cubic feet in Scalby, the revenue was slightly more than in 1905. The accounts showed a sum of £8845 available for distribution; and the Directors recommended the payment of the usual dividends, which would leave £2257 to be carried forward. The Chairman (Mr. B. Fowler, J.P.), in moving the adoption of the report, said the gas sold last year amounted to 300 million cubic feet, the number of consumers exceeded 10,000, and the price of gas stood at the very low figure of 2s. 6½d. per 1000 cubic feet net. These were records in the history of the Company; and the fact that all the public lamps were now fitted with incandescent burners made the year 1906 a memorable one. All the lamps of the old pattern in the main thoroughfares had been replaced by others of the most modern type; and he felt he was safe in saying that the street lighting of Scarborough would compare favourably with that of any town in the kingdom. Incandescent lighting continued to spread among the consumers at a rapid rate, as during the past two years the Company had sold nearly 2000 incandescent burners and about 20,000 mantles; and beyond these no doubt a large number had been disposed of by local plumbers and ironmongers. The report was adopted without discussion. The dividends recommended having been declared, thanks were accorded to the Directors, officials, and staff for their services. The Manager and Secretary (Mr. A. Allan) acknowledged the vote on behalf of the staff, and the ordinary business terminated. The meeting was then made special, and the shareholders' approval was given to the promotion by the Company, in conjunction with others, of a Bill to remove the restrictions in respect of sulphur compounds other than sulphuretted hydrogen.

Satisfactory Business at Wakefield.

Presiding at the 120th ordinary general meeting of the Wakefield Gaslight Company, Dr. W. A. Statter, J.P., referred to the satisfactory nature of the balance-sheet, and pointed out that the dividend had been earned, and a balance carried forward. He said the revenue account showed a larger expenditure on the manufacture of gas, chiefly under the head of coals; there being an increase in the sale of gas to the extent of 2,316,673 cubic feet, or 1·91 per cent., during the half year to Dec. 31. The expenditure on the other items was normal. The total receipts (£22,020) showed a gratifying increase, amounting to £435. The report and accounts were adopted; and it was agreed that, after paying the prescribed dividend on the 4½ per cent. preference stock, the following dividends should be paid, less income-tax: 5¾ per cent. on the £25 and the £5 shares, 4½ per cent. on the £5 "B 5th" shares, and 4½ per cent. on the £10 shares—the balance to be carried to the next account. Hearty votes of thanks were passed to the Chairman and Directors for the satisfactory manner in which they had conducted the Company's business during the half year, and to the officers and workmen generally for their services—coupled with the names of Mr. H. Townsend, the Engineer, and Mr. W. H. Parker, the Secretary.

COLNE VALLEY WATER BILL.

Progress of the Company.

At the close of the half-yearly meeting of the Colne Valley Water Company—which was held last Tuesday at the Charing Cross Hotel—an extraordinary meeting was held, to consider the Bill which the Company are promoting to enable them to raise fresh capital, and for other purposes. The Chairman (Mr. C. E. Keyser), in moving that the Bill be approved, said that it was necessary for the Company to have some further capital, if they were to keep pace with the development of the district. They were desirous of obtaining power to raise £240,000 of ordinary stock and £60,000 of debenture stock. This was an approximate estimate of the Company's Engineers of the amount that might be required during the next twenty years. They had spent over £150,000 within the past ten years; so that the estimate was likely to prove correct, if the district increased in the future at the same rate as it had been doing. Power was sought under the Bill to pay pensions to old officers and servants; but any grants of this sort would be sanctioned by the shareholders, and would not be left in the hands of the Directors. There was also a clause in the usual form which was to be found in similar Bills of water and other companies, to enable the Company to build cottages, &c., for their workmen, so that outlying stores, and things of that kind, might be properly looked after. The opposition to the Bill was mainly with the object of trying to obtain a reduction in the water-rates. The shareholders, however, had a right to be paid arrears of dividend before the charges could be lowered; and large sums had been invested in the Company on the faith of these back-dividends. People must remember that the Company had not always been earning 9½ per cent. They began in a very small way; and their charges were based on the same scale as those of the London Companies, though there were miles and miles of pipes that hardly had to carry any water at all. It seemed to him wrong that the public authorities should complain of the charges; and the Company could not consent to forego the advantages which they obtained under their Acts. In time, however—when the maximum dividends were paid, and the question of back-dividends had been

dealt with—a very substantial concession would doubtless be made to the consumers.

One or two shareholders suggested that if the Directors would arrange a conference with representatives of the Councils concerned over the area of supply, there would be a possibility of some arrangement being come to, Failing this, there would be a large expenditure of the ratepayers' and the shareholders' money. The Chairman said that, of course, the Directors would be only too pleased to come to some arrangement with the Local Authorities, if such a thing were possible; but they had a duty to perform to the shareholders. The time could not now be very far distant when, by automatic action, the consumers would benefit by the Company's prosperity. The motion approving the Bill was carried.

In moving the adoption of the report and accounts at the ordinary meeting, the Chairman said he hoped the shareholders felt that the progress of the Company during the past six months had been as satisfactory as for the last few years. The total amount of the water-rates for the half year to Dec. 31 was £20,147, as compared with £18,295 for the corresponding six months of 1905. This was an increase in the one half year over the other of £1851; and if to this was added the increase in the first half of 1906 over the same period of 1905 (£1138), there was shown a total increase for the past year of £2990. The number of new supplies added during the past six months was 504, estimated to yield an annual water-rental of £1534, and making a total for the year of 939 supplies, and an estimated rental of £2640. The total number of supplies now amounted to about 15,000; while the population served was something like 82,000. The profit for the half year amounted to £13,631; and the Directors had added £2000 to the contingency fund account, instead of £1000, as in previous half years. Out pay out of this account in respect of the old horizontal engines. Out of the balance available, it was proposed to pay dividends at the rate of 9½ per cent. on the 10 per cent. maximum shares and 7 per cent. on the 7 per cent. maximum shares. This was ¼ per cent. more on the former class of shares than was paid for the previous half year. Though a dividend of 9½ per cent. might appear high, it must be borne in mind that the original shares were issued very many years ago; and the average dividend paid on them had only been 3¾ per cent. The original shareholders had to wait nine years before getting any dividend at all, and eighteen years before they obtained more than 3 per cent., and the original Directors had to wait a good deal longer than this before they received any fees, because they declined to take anything until a fair dividend was being paid. The total quantity of water pumped in the past half year was 475 million gallons, as compared with 446 million gallons in the same period of 1905. The consumption per head per diem was the same in the two half years—namely, 25 gallons. With regard to the works, he might say that the new pumping-engine was practically completed; and it was now being worked by the Contractors for three months. The Consulting Engineers (Messrs. John Taylor, Sons, and Santo Crimp) were sanguine that the duty obtained from it would be very satisfactory. The Directors had entered into a contract for sinking a well on the Eastbury Road land, and for laying a pumping-main therefrom to the softening works at Bushey. To provide the necessary money for this work, and for the further extension of mains, &c., the Directors had decided to issue the remainder of the debenture stock (£12,500) authorized by the 1873 Act. The machinery and plant had been maintained in a thorough state of efficiency; and the reports of analyses of the water during the past half year had been entirely satisfactory. He thought that at any rate the district had the best water that could be found throughout England.

The motion was seconded by Mr. A. Helsham-Jones, the Vice-Chairman; and a long discussion ensued. In answer to questions, the Chairman said the contingency fund was not the same as the reserve fund. It was really to provide for replacements which should be paid for out of revenue. The advantage of it was that it enabled any heavy payment to be spread over a period. There was a reserve fund in addition to the contingency fund. One shareholder remarked that, if the Company went to Parliament now, they would possibly have to sacrifice part, if not the whole, of the back-dividends; and he suggested therefore that it would be better to defer the Bill until something had been paid on account of the arrears, in which case he thought Parliament would be more likely to favourably regard the question. The Chairman, however, pointed out that the Bill was purely a finance one, and that the Company had come to the end of their tether, with the exception of the debenture stock to which he had referred.

The report was adopted, the dividends recommended were declared, and the retiring Directors and Auditor were re-elected.

Bacup Water-Works Scheme.—Mr. James Diggle, reporting to the Bacup Town Council on the new Cowpe reservoir works, states that, by arrangement, the time for the completion of the works has been fixed for March, 1908, and there is no reason why they should not be easily finished by then. He thinks that the contract works should be carried out for the amount of the original tender, *plus* the parliamentary estimate for deepening the trenches (say £109,000). It is proposed to proceed with the laying of mains next month. The cost of the transfer of the old undertaking, &c., was £1203; that of the works and plant £48,378; filter-beds and settling-grounds, £11,781; Cowpe scheme and works, £131,822—making, with the parliamentary costs, a total expenditure to date of £197,672.

Gas-Fitters and Municipal Trading.—Speaking at the second annual dinner of the Birmingham and District Master Gas-Fitters' Association last Wednesday, Mr. J. Thacker remarked that the Association was formed with definite objects. These objects had not yet been achieved; but they were pegging away to secure them. The Association met the gas committee with regard to municipal trading; but they were not successful. They thought, however, that if they persevered they would secure concessions which would be of benefit to the trade. There were many grievances from which they suffered; but the worst, perhaps, was direct trading. Another question they would have to carefully consider was that of price maintenance. They were ratepayers; and it was not fair that the municipality should compete with them in their legitimate business as private traders.

PONTEFRACT GAS-WORKS PURCHASE ARBITRATION.

Surveyor's Institution.—Monday, Feb. 11.

(Sir Hugh Owen, *Umpire.*)

On the resumption of the proceedings to-day,

Mr. *Thos. Barker*, an auctioneer and valuer, called on behalf of the Corporation, said he did not agree with what Mr. Garside said as to the possibilities of the development of the surplus land of the Company for building purposes, excepting in regard to two pieces of frontage. He did not think anyone would build houses in the Company's neighbourhood while there was plenty of land available in better parts of the town. The direction building was trending was westerly; and the Gas Company's site was in the opposite direction.

Mr. *W. B. Keen*, F.I.C.A., handed in a list of the transfers of the Company's shares. He said that the last transfer before the notice to treat, in August, 1906, produced a yield at the rate of 5 per cent., and a transfer after the notice to treat was at the rate of 4⅜ per cent. The financial position of the Company on Dec. 31, 1906, showed that they were overdrawn at the bank to the extent of £1011 7s. 4d., which he regarded as a very unsatisfactory feature. In addition to this, there were further liabilities of £335 11s. 11d. and £27 10s. 4d., and £1360 due to the shareholders on Dec. 31 last as half-year's dividend; the total being £2734 9s. 7d. Against these liabilities, there were outstanding debts for gas-rental £2992 13s. 10d., for rentals £461 18s. 3d., and for fittings 13s.; making a total of £3455 5s. 1d. These debts would come in gradually during the first half of 1907; and the Company would have to pay the working costs during this period. He put the working expenses at £1750; and they would have to pay interest on loans, amounting to £130 for the half year—making a total of £1880. He calculated that only £1575 could be treated as being available for paying off the liability of £2734; and therefore this left a current deficiency of £1159 4s. 6d. There was also a deficiency on the reserve fund of £2031 18s. 7d.; for, having regard to the length of the Company's life and the time during which they had been paying maximum dividends, there should have been at least £2724 in this fund—it ought to be full after such a long period. He considered that £1929 had come out of the profits and had been put to the suspense account. Altogether he brought the total deficiency to £3191 3s. 1d. This was a very unsatisfactory position. There had been considerable fluctuation in profits in the last ten years. In four years out of the ten, the net profit had been insufficient to provide the maximum dividend; and in three of the last five years it had not been earned. In the whole ten years the net deficiency was £664. Notwithstanding this, the maximum dividend had in fact been paid with the assistance of the reserve fund. He did not think any notice ought to be taken of the surplus of £600 in 1906. In that year the expenses for coal and repairs were exceptionally low, and, further, there was the fact that it was an account prepared after the notice to treat. It was obvious that the Company would desire to show a favourable balance. The last year was an unsafe one to take in regard to the transfer of the Company. He did not think the Company was a desirable investment. Where the maximum dividend had not been earned in four out of the last ten years, and in three of them it had not been earned by a sum exceeding the equivalent of 1 per cent., it was a very serious factor for an investor to take into account. Then the financial position disclosed by the balance-sheet—namely, that there was practically no reserve fund left out of which to make up any similar deficiency in future years, and the fact that the Company had got to the end of their capital resources—would make one seriously hesitate to buy the shares unless they had some very substantial yield on the purchase price. Then there was the question of electric light coming into competition.

In reply to Mr. Lankester, witness said that none of the shares mentioned in his list were sold by public auction. He had no knowledge of any of the shares being quoted on the Stock Exchange. It was unsatisfactory to have to go to the bank to borrow money to meet expenses; it was an unsatisfactory feature that the Company were entirely dependent on their bankers to meet their financial position.

Mr. *Alfred Walker*, J.P., a member of the Pontefract Council, also gave evidence.

Mr. *John Wilkinson*, the Engineer and Manager of the Halifax Corporation gas undertaking, said he had considered the valuation of Mr. Valon for the Company; and he disagreed with it. He supported Mr. Stevenson's valuation of £60,348, which was a liberal one. He was quite certain they could invest to bring an equal return on a better security. He thought the undertaking was suffering through being over-capitalized. The amount spent on meters, as shown by the Company, gave a life of 74 years per meter, as against a recognized life of 25 years. An alteration in the cost of coal was the most important fact in the alteration of the price of gas. Cheap gas was unquestionably essential to the development of the prepayment meter business; and he was of opinion that the Company must be dependent upon them for the extension of business, though he could not see where it could extend very much. The prepayment business involved greater annual expense by reason of the higher capital charge on meters and the greater cost of collection. The higher charge was met by an increased price for gas. In Yorkshire at the present time this was being objected to. In Halifax 1000 meters had been returned owing to the agitation, and at Huddersfield they were having a similar experience.

In reply to Mr. Clease, witness said that the leakage was 7·79 per cent. He considered that this was very high for the length of mains—16 miles.

Mr. Lankester: Mr. Stevenson has admitted that it is a very low leakage.

Mr. Clease: Then he disagrees with Mr. Stevenson on that.

Mr. *Garside* was recalled to substantiate his position as a valuer; and Mr. *G. R. Hemingway*, of Messrs. Leatham, Solicitors to the Company, also gave evidence.

Mr. Wedderburn, in addressing the Arbitrator, said that the Corporation were really buying an income; and the object of the award must be to insure to every shareholder in the Company an amount which he could invest so as to obtain an equal and equally secure income. The claim of the Company was grossly exaggerated. He

did not hesitate to say that, although he had been in a fair number of arbitrations, the portion of the claim based upon the conversion of the loan capital was entirely new to him. It appeared that it was made in two cases—in Morley and Skipton, in 1898 and 1899—and had never been made by anybody since. The Arbitrator would see at once that it was a strange and novel plan. The sum he had got to consider was divisible profits; and the profits capable of division must be maximum dividends on the issued, and not on the unissued, capital, because they could not divide dividends on unissued capital. In dealing with the question of security, he said that a witness who would come and say that this was a security equal to the best a man could get, would come and say anything. He contended that it was a great disadvantage to buy a gas undertaking which was saddled with a lot of surplus land. In conclusion, he should be very sorry if the Corporation had approached the case in a spirit as niggardly as the Company's case had been exaggerated.

Mr. LANKESTER replied at some length, and claimed that every figure he had put forward in his opening a week before was justified. Dealing with the point of the conversion of loan capital, he said that if the right to convert the money borrowed was a valuable asset, then it ought to be paid for. It certainly was not an absurdity to treat this concern as quite as good as an income secured in the ordinary trustee securities. He could not understand the pessimistic view of the Corporation; one could not conceive why they wanted a miserable, broken down, and unprofitable business like this. [Laughter.] He thought that probably the Arbitrator would take the intermediate view between the Corporation's excessive enthusiasm when before Parliament, and their extremely gloomy view in these proceedings. He argued that a substantial percentage should be added for compulsory sale. His friend suggested that it was a sum given for sentiment; but he did not know that 10 per cent. was ever given for this reason at all. There was no sentiment in the matter.

The proceedings then terminated; and the Umpire will in due course make his award.

WOKING AND GUILDFORD WATER ARBITRATION.

Arbitration proceedings between the Woking Water and Gas Company and the Guildford Corporation were commenced last Tuesday at the Surveyors' Institution, Westminster, before Sir JOHN WOLFE BARRY, K.C.B.

Mr. BALFOUR BROWNE, K.C., and Mr. W. H. DICKINSON, M.P. (instructed by Messrs. Charles A. Bannister and Reynolds), represented the Company; and Mr. E. HONORATUS LLOYD, K.C., Mr. VESEY KNOX, K.C., and Mr. R. S. CLEASE (instructed by Mr. F. S. Miller, Town Clerk) appeared for the Corporation.

Mr. BALFOUR BROWNE, in opening, said that the object of the arbitration was to settle, under the provisions of section 38 of the Woking Water and Gas Act, 1899, sub-section 4, the price and terms of purchase by the Guildford Corporation of such portions of the Company's undertaking—except the mains, water-works, pipes, &c., necessary or convenient for supplying water elsewhere within the Company's limits—as were included within an extension of the borough of Guildford. The limits of the Company were extensive; but the part which was affected in this arbitration was to the north of the borough of Guildford, and was added by the Act of 1904. The district was that known as Stoke-next-to-Guildford. In detailing the history of the Company, the learned Counsel said that they had obtained three Acts of Parliament, and had extended their powers and capital on several occasions. Under their original Act of 1881, the capital was £50,000, with borrowing powers to the extent of £12,500. It had now been increased until the authorized loan and share capital was as follows: Share capital, £228,250; loan capital, £57,062—making a total of £285,312. Of this sum, there had been raised in share capital £168,515; and there had been borrowed £38,312—making a total of £206,826. The Company still had power to raise by share capital £59,735, and by borrowing £18,750—a total of £78,485. The profits of the Company for the last seven years had been: In 1899, £4936 15s. 1d.; in 1900, £5051 0s. 5d.; in 1901, £5489 12s. 7d.; in 1902, £6113 6s.; in 1903, £7594 5s. 1d.; in 1904, £8121 15s. 11d.; and in 1905, £8707 1s. 10d. This profit was before reckoning payment of interest on loans—the total divisible profit between the Company and the persons who had lent their money. Every year there had been a steady and substantial increase in the revenue of the undertaking. The dividends paid had not been large. Since June, 1901, they had not been able to pay more than 4 per cent.; but the reason was that no less than £80,958 had been spent on the Chertsey station, with a view to future profits. By this station water was able to be drawn from the River Thames. The present supply of the Company averaged only 630,000 gallons; the maximum supply being about a million gallons, or 30 gallons per head of the population per day. The total population was 34,736. It was calculated that the supply needed in 1917 would be 1,645,175 gallons, which was a quantity well within the Company's means. The price at which the portion of the undertaking in question was offered to the Corporation was £105,307, exclusive of costs. The Corporation replied to this by making an offer of £18,700. He could only conceive that the Corporation had taken some altogether wrong basis of calculation. The basis the Company had gone upon was the value to them of the portion of the undertaking that was taken from them; and the value to them was what they made out of it.

Mr. HONORATUS LLOYD remarked that he was not going to suggest any other basis than that put before them.

Mr. BALFOUR BROWNE said that, then, would save a good deal of time; for he would now proceed to deal with the claim. He stated that the offer of the portion of the undertaking in question for £105,000 was merely a rough estimate; and, on going into the matter more fully, the Company had arrived at a more exact claim, which they made £73,626. This was arrived at as follows: Profit for 1905, £907 (for the severed area), and this sum, capitalized at 36·36 years' purchase, was £27,908; present value of the future prospects of the Company, £28,521; arrears of dividend, £7551; damage by severance, £9969—making a total of £73,949. From this amount would have to be deducted £7016, being the sums that would have to be spent in order to maintain the portion of the undertaking in question. This brought the claim down to £66,933. Then it was proposed to add 10 per cent. for compulsory purchase, £6693—making the total claim to be £73,626.

Mr. *B. D. Holroyd*, the Secretary of the Company since 1892, having given evidence, the proceedings were adjourned.

The proceedings were resumed on Friday, when

Mr. *Joseph Quick*, M.Inst.C.E., the Engineer to the Company, describing their works and plant, stated that there were 120 miles of mains in the district at the present time. The quantity of water supplied in 1888 was 70 million gallons; in 1893, 102 millions; in 1897, 133 millions; in 1898, 121 millions; in 1899, 125 millions; in 1903 (when the new works came into operation), 187 millions; and in 1905, 230 millions—a daily average of 632,000 gallons. The number of houses supplied in 1902 was 4305, increasing to 4770 in 1903, 5322 in 1904, and 5732 in 1905. Apart from the Bisley Camp, there was a population of 3722 persons in public institutions in the district. The daily average consumption in the Company's area in 1905 was 18·95 gallons per head of the population. On this basis, the maximum daily supply which would be required in 1917 was 1,687,000 gallons, and the average daily supply 1,130,000 gallons. To meet this, the Company had an available daily supply of 800,000 gallons from the Clandon wells and the Dapdune well, and 2,000,000 gallons from their Chertsey well; or a total of 2,800,000 gallons without taking any water from the Thames. If desired, they could take from the River Thames 1 million gallons per day unconditionally, and a further 2 millions conditionally. In taking 30·77 years' purchase as the multiplier to arrive at an estimate of the future profits on the area proposed to be taken by the Corporation, he thought the Company were claiming by no means a high price. The income was amply secured, as shown by the steady increase in past years; and the district was a rapidly growing one. It had been arranged that the Corporation should take the existing mains which would be required by the Company for the supply of parishes outside; and the Company would lay a new main through Stoke at the expense of the Corporation. An item of £7551 was claimed for arrears of dividend; and this amount was arrived at upon the basis that in the year 1918 the profits would have swelled to an amount sufficient to pay the maximum dividend, and in the following years there would be a sum left to pay off the arrears of the previous period.

The ARBITRATOR: Have you made any comparison between the estimated proportion of capital expenditure in the severed area up to 1924, and the probable special expenditure in that district?

Witness: No.

In reply to Mr. BALFOUR BROWNE, witness said the proportion of mains in the severed area was greater than in the rest of the district, so that, instead of the capital outlay in the severed area being £7016, it would be £2000 or £3000 less in respect of future expenditure.

Replying to Mr. VESEY KNOX, witness said he had always taken a very sanguine view of the prospects of the Company's area. He regarded the Woking district as a kind of second Croydon.

Mr. VESEY KNOX: Woking is the centre of your district, and the place where you derive most of your revenue?

Witness: Woking was at one time the best part of the district, and is now an exceedingly good one; but this neighbourhood would be equally as good as Woking.

Are certain works to be freed by the severance of this district which you can use more economically than your Chertsey works? Is there any sum credited to the Corporation for that?—The economy would be small, and nothing has been credited.

Mr. BALFOUR BROWNE: The rate of increase in the severed area in 1904 was 9·81 per cent., compared with 7·11 per cent. for the whole district; and in 1905 the respective figures were 8·78 and 8·21?

Witness: Yes, that is so.

Mr. *Walter Hunter*, M.Inst.C.E., said there was a large and rapidly-increasing population in Stoke, which had an area of 2000 acres. It was close to Guildford; and it was in this direction that the town must develop. It was one of the most valuable portions of the Company's undertaking. He thought a percentage of 41·3 was a fair expenditure compared with the income derived from the severed area. He agreed with the number of years' purchase estimated by Mr. Quick (30·77), and should have placed it on a higher basis himself but for an expression of opinion in the London Water Arbitration. In his view, the Company were in a better position than the London Companies, because there was no sterilization clause or interference with future profits.

Mr. VESEY KNOX: Do you say there will be a loss to the Company in perpetuity of £324 on working expenses in consequence of this severance?

Witness: I will not give an opinion on that; I would rather leave it for the Arbitrator.

The ARBITRATOR: Is there any reason why the increase in working expenses shall not be upon the same basis in the severed district as in the remainder?

Witness: I should say the working expenses in the retained district will be greater than in that given up.

The ARBITRATOR: Then your opinion is that it is a concession taken relatively?

Witness: That is my opinion.

Sir *Alexander Binnie*, M.Inst.C.E., agreed with previous witnesses that the multiplier of 30·77 was a fair figure to take in dealing with the Company's undertaking.

Mr. BALFOUR BROWNE: If you take a valuable asset from us, and leave us with expenses we cannot by any possibility reduce, is not that a fair matter for compensation?

Witness: I say it is a fair matter for compensation. The difficulty is how to arrive at it.

Replying to Mr. VESEY KNOX, witness said Thames water had been declared by the best authorities to be a good supply. Parliament had given the Company a legal right to take the water; and they were entitled to regard it as a profitable asset.

At this stage the proceedings were again adjourned.

FALMOUTH GAS BILL.

Opposition by the Corporation.

A Meeting of the Falmouth Town Council was held yesterday week, to decide whether a petition should be lodged against the Bill which is being promoted by the Falmouth Gas Company.

At a previous meeting, suggestions had been made of alterations which the Corporation desired should be effected in the Bill; and the question was now asked whether any reply had been received from the Gas Company. The Town Clerk said he had received a letter from the Secretary, suggesting that a conference between the Corporation and the Directors should be held that morning. Mr. E. Williams and Mr. Chard strongly protested against the action of the Mayor in not responding to this invitation. Mr. Williams had previously been in favour of lodging a petition; but he now contended that the suggested conference ought to have taken place before the meeting of the Council, and that its probable effect would have been to avoid the cost of opposition in Parliament. Mr. Owen held that it was unreasonable to ask them to meet the Directors two hours before the time fixed for the Council meeting. Personally, he agreed with the Town Clerk that they should lodge the petition first and have a conference afterwards.

An acrimonious discussion followed as to the exact nature of previous correspondence between the parties, and the understanding with regard to the lodging of the petition. Mr. Fox contended that, even if the conference had been held with the Directors that morning, it would still have been necessary to lodge the petition. It would not prejudice either side in the least in the concessions they might get or make. Mr. Mead, on the contrary, thought it would have been a saving of trouble and expense to meet the Directors. If the conference had been held, the Council meeting could have been adjourned until later in the day to give them an opportunity of considering the matter. Mr. Cox also took the view that there should have been an opportunity of coming to a friendly understanding with the Company. Mr. Bullen said the Mayor had acted wisely. The Corporation were not in a position to meet the Company that day any more than the Directors were prepared to meet the Corporation when they were previously invited to do so. It was only fair and just that the Corporation should have the same opportunity of protecting the interests of the ratepayers as the Directors had of looking after those of the shareholders. The door was still open for friendly negotiations; and he hoped the Directors would see this. The Town Clerk pointed out that the petition must be lodged on the following day; and he advised the Corporation to lodge it, and then see what concessions the Company were willing to make.

On a vote being taken, it was decided to lodge the petition; three members who had spoken against it being not present when the vote was taken. The General Purposes Committee of the Council were authorized to take the necessary steps to oppose the Bill.

Report of the Corporation Engineers.

Messrs. Stevenson and Burstal are the Engineers advising the Corporation. In their report, they point out that the £20,000 which the Company propose to raise will enable them to keep away from Parliament for at least fifteen years, if the growth of the undertaking is at the same rate as hitherto. They advise that there should be a proviso that none of the loan capital shall be converted into share capital, and that the auction clauses shall apply to loan and share capital alike. They also consider that the rate of 6 per cent. at which it is proposed to issue preference stock is too high, and that it should not exceed 5 per cent. With regard to the proposal of the Company to substitute the "Metropolitan" argand No. 2 burner for the Sugg "London" argand burner now in use for testing purposes, Messrs. Stevenson and Burstal say they should not advise that any opposition be made to this burner, because it is the only known burner which shows the actual illuminating power of the gas; and in a very short time it will become the common standard burner for all gas companies. Nor do they object to the mode in which the gas is to be tested. But they draw attention to the fact that the use of this burner will enable the Company to supply gas of a lower illuminating power than they do, or may do, at present, and yet keep within the prescribed illuminating power of 15 candles. The Company, they say, by this obtain an alteration of the illumination power in their favour of at least 2 candles. It is usual and almost universal that a reduction in the illumination power is accompanied by a reduction in price; and therefore in their opinion the standard price of gas should be reduced at least 2d., which will be approximately the saving effected by the Company. They think there is no possibility of the Corporation obtaining a reduction in the standard price except upon this ground.

Another point upon which Messrs. Stevenson and Burstal report at length is a proposal by the Company to acquire additional land for the extension of the works. They say that the works are in a very cramped and crowded position, and that the small area of ground proposed to be acquired will do little if anything to alleviate this condition. They urge that now is the proper time, if ever, to shift the works from the centre of the town to somewhere on the borders of it. Any further expenditure upon the present or the proposed extended site would entail a greater cost of removal in the future; and the time must come, if the undertaking grows, when it will be absolutely imperative that the works should be removed and new ones erected. Replying to a question asked by the Corporation, Messrs. Stevenson and Burstal say they do not think the Corporation could successfully ask for the introduction of a clause prohibiting the Company altogether from the use of water gas; but they might possibly obtain a clause restricting its use to a certain percentage, except in an emergency. This is a point, they add, which has not been seriously brought before a Committee of either House. In reference to the accounts, the report draws attention to certain apparent illegal acts committed by the Company. The Engineers add that in the event of the Corporation deciding that they would acquire the undertaking if they obtained the sanction of Parliament, there is very little doubt that a purchase clause might be inserted, or at least a suspensory clause, prohibiting the Company from making any use of the powers which the Bill may confer until the Corporation have had a chance of introducing a Bill. They have no doubt that purchase would be remunerative to the town.

The Corporation's Petition.

In their petition against the Bill, the Corporation submit that in the interests of the borough the works should be in their hands; and that in order that they may have an opportunity of applying for powers to purchase the undertaking, provision should be included in the Bill suspending its operation. It is alleged that large sums have been expended by the Company out of revenue for the provision of new mains and works, instead of being applied to the reduction of the price of gas. The Corporation submit that it is inexpedient to further extend the works upon the present site; and that the Company should be required to procure a more suitable site at a distance from the more inhabited parts of the town. Restrictions should also be imposed upon the Company with reference to the use of their existing land, and to the generation and supply of water gas and the manufacture and conversion of residual products. Provision should also be made for imposing penalties upon the Company for allowing gas liquor and other objectionable substances to fall into the harbour. Among other matters dealt with, the Corporation repeat the argument of Messrs. Stevenson and Burstal as to the effect of the substitution of the "Metropolitan" argand for the "London" argand burner for testing purposes, and contend that the standard price should be correspondingly reduced.

WORTHING CORPORATION AND THE GAS COMPANY.

The Proposed New Works at Goring.

The Bill which the Worthing Gas Company are promoting in the present session of Parliament, to enable them to erect works at Goring, to extend their limits of supply, and for other purposes, has been the occasion of much negotiation between the Parliamentary Committee of the Corporation and the Company. As a result, the Committee obtained satisfactory assurances on all but two points; and under these circumstances, a special meeting of the Council was held last Saturday week, for the purpose of deciding whether the Bill should be opposed. After deliberation, the Council approved of a petition being presented if the Committee did not receive the assurance of the Company that all the Council's requirements would be given effect to.

At the commencement of the proceedings, the Mayor (Alderman F. C. Linfield, J.P.) stated that he had received a letter from Mr. Schweder, to the effect that the whole of West Worthing was against the scheme. The Mayor also announced that he had received a deputation from several of the owners and residents round about the existing gas-works, who wished to be assured that if the works were removed the Company would not erect another or larger gasholder on the site. The way having thus been cleared for debate, Alderman Piper proposed that the seal should be affixed to a petition against the Bill; but that it should not be lodged if by 2 o'clock on the following Monday they were assured that the Company would so amend the Bill as to give effect to all the requirements of the Council set forth in the petition. They did not, he said, oppose on the ground of the site. They realized that the Company must carry on their business somewhere; and it was perfectly intelligible that wherever they went the people in the immediate neighbourhood would look upon them as a nuisance, and do their best to keep them away. But as representing the town, he submitted that it was more in the interests of the borough that they should have gas-works erected 850 yards from their western boundary, than that they should run the risk of having the works extended almost in the centre of the town. On most of the points on which the Committee had met the Company, he must say that the latter had met them very fairly indeed. For instance, they had agreed to prepare a clause to the effect that within ten years of their beginning to manufacture gas at Goring thay would cease to do so on the present site. They had agreed that nothing in the Bill should be construed as admitting a right on their part to discharge sewage into the sea at Goring; and they had also agreed that the proposed preference shares should only be entitled to a dividend of 5 per cent., instead of 6 per cent. With regard to the renewal fund clauses, the Committee considered the Company's proposal to be able to set aside a sum not exceeding 1 per cent. of the total capital until 20 per cent. had been accumulated, was too much; and they had suggested that the limit should be ½ per cent. each year, until the total reached 5 per cent. of the capital. Unfortunately, the Company had not so far assented to this; and they had also failed to meet the Committee's wishes with reference to the excess of profits. At present, the latter clause in the Bill read as follows:—

> If the clear profits of the undertaking of the Company in any year amount to a larger sum than is sufficient to pay the dividends on the preference capital, if any, and dividends at the authorized rates on the Worthing gas consolidated ordinary stock of the Company, the excess of such portion of it as is not carried to the insurance fund or renewal fund shall be carried to the credit of the divisible profits of the undertaking for the next following year.

Unless some alteration was made to this clause, the members would see that the Company might go on carrying over and piling up the excess of divisible profits year after year; and the public would not stand the remotest chance of getting a reduction in the price of gas by the operation of the sliding-scale. The Committee had accordingly suggested a limit of three years for this arrangement; and though the Company had so far been unable to comply with their wishes, he was in hopes they would see their way to do so before the period for sending in petitions in opposition expired.

When the motion had been seconded, an amendment was proposed by Mr. Gravett, to the effect that the latter part of the resolution should be deleted, and the petition be lodged in any case. This, he argued, would give the ratepayers an opportunity of raising their voice for or against the Bill; and it would also give the Finance Committee further time to negotiate with the Company. Mr. Chignell

regretted that the question of the site was to be left out altogether; but the Deputy-Mayor (Alderman J. White, J.P.) remarked that the distance from their boundary to the proposed new works was such that they could not successfully resist the location of gas-works there; and he for one would be the last to recommend that the Council should become the catspaw of any person who might wish chestnuts to be pulled out of the fire for him. Dealing with some of the points that had been the subject of negotiation with the Company, he pointed out, with reference to the renewal fund and the disposal of surplus profits, that the competition of the Council's electric light undertaking would make it to the Company's interest to behave as liberally as possible to the consumers. Seeing that they had so nearly approached complete agreement with the Company, he thought it would be manifestly unfair both to the Company and to the Committee to throw all their negotiations on one side, and place themselves in an attitude of extreme antagonism to the Company. Several members asked what the Company would do with their effluent and drainage at Goring; but Alderman Piper suggested that this question (with the assurance they had had from the Company as to not discharging it into the sea) could be safely left with the Goring Sanitary Authority.

Later reports stated that there was every reason to believe that all the assurances demanded by the Council from the Company would be forthcoming.

TESTING OF BIRKDALE GAS.

The Proposed New Burner.

In moving the adoption of the Southport Gas Committee's minutes by the Town Council, Alderman Travis drew attention to the following recommendation: "That the Engineer be empowered to arrange for the daily testing of gas in Birkdale, and to hire a room and purchase the necessary apparatus." At the present time, he said, regular testings were not made in Birkdale. He found that on Jan. 4 the gas was tested there; and it showed an illuminating power of 16·02 candles. On Jan. 8, it was tested again; and the average was 16·012 candles. These were the only two tests taken during the four weeks; and the Committee thought it desirable that they should have regular tests, so that they might know exactly what was the quality of the gas they were supplying, not merely in Birkdale, but in other parts of the town at a similar distance from the gas-works. Of course, tests would also be regularly taken as to the pressure of the gas. A room would cost about £10 a year; and the fitting up would entail an outlay of about £100. They were desirous of giving every satisfaction to the gas consumers; and they thought the present proposal was a step in this direction.

Alderman Travis also alluded to another recommendation of the Committee: "That the Chairman and Town Clerk be empowered to give an assurance to the Board of Trade that any saving which may accrue in consequence of the use of the 'London' No. 2 argand for testing the gas shall be given to the gas consumer." This, of course, he pointed out, was subject to the fluctuations in the prices of the carbonizing materials. He himself had had a hope that if they secured this burner for the purpose of testing the gas, added to certain improvements in the method of manufacture which they were carrying out, they might have been able to make some reduction in the price of gas. But the price of coal had gone up very considerably; and therefore it was impossible to carry out the idea of a reduction at the present time. The Committee hoped, however, notwithstanding the advances in the price of coal, that if the burner were allowed by the Board of Trade—and they now had every reason to believe that it would be—together with the improvements they were adopting at the gas-works, they might be able to stand the advances without any increase in the price of gas. He hoped that this had seen its highest point.

The minutes were confirmed.

Lincoln Water Supply.

At the Guildhall, Lincoln, last Thursday, Mr. W. O. E. Meade-King, M.Inst.C.E., an Inspector of the Local Government Board, held an inquiry into an application by the Corporation for sanction to borrow £11,082 for purposes of their water-works undertaking. In the course of the inquiry, evidence was given by Mr. Neil M'K. Barron (the Water-Works Engineer) and by Mr. J. H. Burgess (the City Accountant). Mr. Page explained that the work had practically been completed, and the application for power to borrow the money was lodged in February, 1906, so that it had been before the Board for a year. Speaking generally, a great deal of work was necessary at the filter-beds, as a new bed had to be constructed; a rearrangement was required of connecting-pipes, valves, &c.; and new mains were wanted. The proposed expenditure would come really under three heads: (1) The new filter-bed; (2) the improvement of the existing beds, with all the necessary pipes and valves; and (3) new clear and raw water tanks and an iron aqueduct from two sources of supply known as the ballast pits and Hartsholme Lake. The exact cost was £15,015, and it was intended to pay one-seventh of it out of revenue. Mr. Barron gave a detailed account of all the work done. The Inspector inquired as to the possibilities of the borehole; and it was stated that the boring was going deeper into the pebble beds with the hope of getting a greater supply, and possibly a better quality, of water. The contractors had claimed £2000 as extras, because of the alleged interference with their special work by reason of the Corporation doing other work on the same ground; but the claim had been settled for £414 14s. 10d.

Hire of Gas-Stoves at Burton.—Owing to bad trade, many of the houses in Burton-on-Trent have become empty; and the Gas Committee are therefore in the unfortunate position of finding themselves with many gas-cookers on their hands. Under these circumstances, an arrangement has been come to between the Council and the ironmongers of the town for the pushing of these appliances; the ironmongers to be allowed a quarters's rent on the stove and the price of fixing.

THE PARTIAL FAILURE OF DUNDEE GAS.

Reference was made in our "Notes from Scotland" last week, and is again this week, to the partial failure, in the matter of illuminating power, of the gas supplied in Dundee, on the evening of Thursday, the 7th inst., and to the Engineer and Manager (Mr. A. Yuill) having reported to the Gas Committee upon the subject. The following is the text of Mr. Yuill's report.

It is my duty to report to you about a diminution in the illuminating power of the gas supplied during a part of the evening of Thursday, the 7th inst. The first intimation I had of this was while I was engaged in the gas office, Commercial Street, a little after 4 p.m. I went immediately to the works, and found that the cause was due to air having been drawn into the main-piping at the retort-house. In the first case, I ascertained that the gas passing from meter to gasholder was all right, and immediately took steps to lessen the difficulty and improve the gas going into consumption, which happily passed off at the extreme end of the city about 6 p.m. On Thursday morning, 24 retorts were put out of action, the gas from which would be all evolved by midday. On investigating the matter, I find that no information was received by the exhauster-house attendant to alter in any way the vacuum previously arranged for. To facilitate this, a telephone was erected over three years ago, so that those in the retort-house may command any vacuum they desire. At the time above noted, an inferential jet photometer was also erected in the meter-house under the observation of the attendant there, to take periodical inspection of same and note the hourly readings in the meter-book, along with the make of gas, the pressure, and stock. On making an inspection, I was surprised to find that the jet photometer failed to register the standard quality at 3 p.m., and was noted in the book; the same entry appearing at 4 p.m. And, despite this, no action was taken by the meter-house attendant nor information imparted to either Mr. Donald or Mr. Gentry, the latter of whom attends to the illuminating power of the gas. I have taken steps to have the meter-house attendant who was in charge that afternoon removed to another position demanding less responsibility.

Another phase of this question presents itself in the fact that no one at the works was conscious of anything being wrong until telephoned from the gas office before leaving for the works—which undoubtedly points to carelessness and neglect. I am conscious you share with me in the desire to lessen as far as possible any difficulties and inconveniences to consumers; and, as you are aware, when dealing with the human element we are at once faced with a difficulty not easily got over, more especially when the actions savour of stupidity or indifference. At the same time, I feel that even this must be minimized as far as possible; and with this object in view, I have arranged to have a self-recording pressure-gauge fitted up in the exhauster-house, to give a record of the vacuum during 24 hours, and will also have the governing arrangement of the exhausters rendered as sensitive as possible, to minimize any risk, and take other means to maintain a constant vacuum on the retort-bench.

PROGRESS OF GAS SUPPLY AT GUILDFORD.

Interesting Reminiscences.

In a recent number of the "Surrey Times," some particulars in regard to the progress of gas supply at Guildford were given in a letter by Mr. D. Williamson, J.P., who was formerly Chairman of the local Gas Company. Personal reminiscences of this kind are specially interesting at the present time, in view of the recent occurrence of the Centenary of Gas Lighting in London; and we therefore make the following extracts from the letter.

Gas was introduced to Guildford in the year 1823 by a Mr. Rofe, who invited the Toll End Company (that is, the Road Commissioners) to join him in the erection of gas-works. This was in the month of October, and the enthusiastic promoter promised that the lighting of the town could be accomplished by the following Christmas. Such a pace was, however, resented by the authorities, and considerable delay occurred before the Company was actually formed. The proposed capital was £3500; and on this basis the works were built and mains laid in 1824. But, like many other such estimates, the actual cost was some few hundreds more. A meeting of the townspeople was called, and it was decided to increase the capital to £4000, and shares of £25 each were issued.

It was necessary to place the works on the lowest level of the town, and also near to the river, as all the coals had to be brought by barge; so the site was in the new Farnham Road. They were thought to be sufficiently large to provide gas for the lighting of the streets and shops, "as well as the private residences of such of the gentry and shareholders as may be pleased to admit it into their houses." It was doubtless regarded as a dangerous innovation, and its progress was very slow. For many years the Company did not pay a dividend, as the promoters had agreed that the rating for watching and lamps was not to be increased; but this restriction was afterwards waived by the town authorities. The Trustees of the Epsom Road would not go to the expense of a light at the top of Spital Street, so the Gas Company erected a handsome pillar and lamp at their own cost; and this still exists with an explanatory inscription upon it.

With regard to the plant, Mr. Williamson records that the retorts were of iron, from 5 to 6 feet long, instead of the present fire-clay retorts 19 feet in length, though the number they began with was 10. Three were placed over one furnace, and two over another; and the other five were apportioned for the production of coke suitable for the maltsters. One of the old iron retorts was long preserved as a curiosity at the works. In the summer season, it was thought that two retorts would be sufficient; in spring and autumn, that there might be three; but that in winter five retorts would be available. There are now about 144 retorts in use, requiring something like 14,000 tons of coal per annum. The original gasholder would contain 12,988 cubic feet; but

it has long been deposed from its high position to become an underground tank for tar. The holders now in use are of the aggregate capacity of 1,430,000 cubic feet, or considerably more than a hundred times larger than the holding capacity in 1824.

As the works were not prospering, they were let in 1827 on a five years' lease to a Mr. Wilder, who paid an annual rent of £40 to the Company, and was to have some advantages from any extension of gas lighting or the sale of coke. He was succeeded by Mr. William Hooke, who had much to do with the extension and popularity of the undertaking. The price of gas was then 15s. per 1000 cubic feet; but under his able supervision it was considerably reduced. In the early forties, Mr. Hooke called in the help of Mr. J. O. N. Rutter, who was then the Engineer of the Old Brighton Gas Company, and one of the foremost gas authorities in the kingdom. He advised considerable reconstruction of the works, and a still further lowering of the price, so as to make the use of gas more popular. Mr. Rutter always spoke in the highest terms of Mr. Hooke as a man of great capability and intelligence, not only in his business, but as a widely cultivated man. He has been succeeded by many capable managers. The removal of the works from Farnham Road to the present site in 1852 brought in the necessity for more scientific management and economical processes. The price of gas was gradually reduced, until in 1880 it had been brought down to 4s. per 1000 cubic feet. Since then, by gradual reductions, it has reached the present figure of 2s. 11d. The annual make of gas is now about 180 million cubic feet. The reconstruction of the works and the building of the large gasholder were rendered necessary by the great extension of the business. This was begun under the chairmanship of the late Mr. Mark Smallpeice, when a sum of more than £20,000 was expended.

Mr. Williamson closed his letter with the following remarks: "It has been well said that if you find a town well lighted it is, as a rule, being well administered. This can be claimed for Guildford; for the town authorities were one of the earliest to give their sanction to the present system of incandescent lighting over the 30 miles of mains in the enlarged borough. Money wisely spent on street lighting is a great help to lessen crime, vice, and dirt, not only for the principal streets, but still more for those in which the labouring classes reside. The enormous demand for gas-stoves for cooking shows its wide appreciation, as well as the yearly increase of gas-engines. The competition of electric lighting has been of great benefit in stimulating invention, and keeping down the price as low as possible consistent with good illuminating qualities. Long may they flourish! There is surely plenty of room for both. The call is ever for more light, and in neither case is there likely to be any finality for a long while to come; nor are the possibilities of the two rivals for the benefit of the public yet able to be estimated."

SHREWSBURY WATER SUPPLY.

Reduction of the Water-Rates—Serious Friction with the Local Government Board.

At the Meeting of the Shrewsbury Town Council on Monday last week, the report presented by the Water Committee contained a recommendation for a reduction of the water-rate, to be effected by fixing it at 5 per cent. on the rateable value of property supplied with water, instead of at 6 per cent. as hitherto. It was stated that the reduction would amount to nearly 2½d. in the pound. Then came the following paragraph: "The necessary application has been made to the Local Government Board for sanction to the loan of £5000 for protecting and improving the supply of drinking water to the borough; but your Committee deeply regret to have to report that the Board have declined to entertain the proposal unless the Council will give an undertaking to proceed with a scheme for the general supply of the town. The Board urge that Mr. G. R. Strachan's river scheme (estimated to cost £88,000) should be taken in hand, and suggest that this may be proceeded with without the consent of the ratepayers. The position is a difficult and serious one, and a deputation, consisting of three members of the Water Committee, has been appointed to wait upon the Board and explain the urgency and importance of the question, and the serious consequences which must ensue if the Board decline to recede from the attitude they have taken up."

In moving the adoption of the report, Alderman Morris, the Chairman of the Committee, said he was sure the Council and the town generally would be glad to see that the Committee recommended a reduction of the water-rate. Another paragraph in the report did not afford such pleasant reading. Putting the matter in a word, it was this—that the Local Government Board were of opinion that they were much better able to manage the water undertaking of the town than the Council themselves. Following upon the resolutions of the Council authorizing the Committee to incur an expenditure of £5000 in improving and extending the conduit supply, application was made to the Local Government Board for sanction to borrow the money. Correspondence had taken place, and the position which the Board had taken up was, to his mind, a puerile one. They did not say for one moment that the Council were not wise in taking the steps they proposed, but they told them they would not allow them to carry out the work unless the Council would give them an undertaking to proceed at the same time with a larger scheme for the general supply of the town. Such a position they did not mean to accept "lying down." They knew what the town wanted better than the Local Government Board. He might say that every step was being taken to overcome the difficulty, and at the present moment they were engaged in trying to arrange that a deputation of the Water Committee should have an interview with the President of the Board. His own view was that their position was being prejudiced by officialism; and he thought if they could only get an interview with Mr. Burns, they would be able to convince him that the attitude they had taken up was the right one. The Committee had made up their mind that the land at the conduit head must be purchased; and he thought the position taken up by the Central Authority was a most ridiculous one. The report was adopted.

ENGLISH AND FOREIGN COMPANIES IN FRANCE.

In the "Financial News" recently attention was called by M. Pellerin, a French Barrister, to the passing, on the 31st ult., of a Finance Bill in which there is an article (No. 3) containing stringent provisions affecting French, English, and Foreign companies contemplating issuing shares or debentures in France, or whose securities may be dealt with in that country. M. Pellerin had previously directed attention to the matter, and his letter was noticed in the "JOURNAL" for the 15th ult. (p. 171); but he returns to it because he thinks too much publicity cannot be given to the enactment, which comes into operation on the 1st prox. After this date, it will be necessary, before any steps are taken to issue or offer for sale upon the French market any shares, debentures, or securities, of whatever nature, of French or Foreign companies, to insert, in a "Bulletin" annexed to the "Journal Officiel," in a form to be determined by a special decree, a notice containing the following particulars: (1) The full name of the company or of the undertaking; (2) an indication of the law which will govern the working of the enterprise; (3) the registered office; (4) the objects of the enterprise; (5) its duration; (6) the amount of the capital, the amount per share of each category of shares, and the amount of capital remaining to be called up; and (7) the latest balance-sheet, certified as being a true copy, or a statement that the same has not been drawn up. In addition to giving these particulars, the advertiser must state the amount of debentures already issued by the undertaking, with a description of the securities attaching thereto, and, if it should relate to a fresh issue of debentures, the number as well as the value of the securities to be issued, the interest payable upon each, the date and the conditions of reimbursement, and the guarantees or security upon which such further issue is based. Persons issuing, offering for sale, or selling, and persons introducing these securities for sale or issue, must be domiciled in France; and they must affix their signatures, with their addresses, to the notice. Advertisements, prospectuses, and circulars must reproduce the statements contained in the notice, and mention that it was inserted in the "Bulletin," with a reference to the number in which it was published. Every foreign company making a public issue in France, or offering for sale or selling or introducing shares, debentures, or securities of any nature, must, in addition, publish in full the Memorandum and Articles of Association, in the French language, in the "Bulletin," previously to any securities being placed. There are some other provisions in the article; and non-compliance with any of them will be punishable by fines ranging from 10,000 frs. to 20,000 frs.

A BELATED CONFESSION.

An extraordinary story of wrong doing and very belated confession was published in last Tuesday's "Express," the writer of which puts it forward as a remarkable illustration of Æsop's fable of the frozen adder.

It is stated that some 24 years ago Mr. Henry Snelling became Manager to the Northfleet and Greenhithe Gas Company. A year or two later, he befriended an orphan lad named Pearce, provided him with an outfit, and found a place for him in his office. Pearce was a bright, intelligent lad; and in a few years' time rose to a position in the Company second only to the Manager himself. Towards the end of 1890, a series of threatening letters reached Mr. Snelling; and as they continued, he began to suspect a conspiracy, and spoke to the Chairman of the Company about the matter. Then he discovered that similar letters had been forwarded to the Chairman; and that statements had been made that he had embezzled money and falsified the accounts.

Mr. Snelling at once asked that the fullest inquiry might be made; but before this was undertaken, the office was broken into and the credit-book stolen. With the books that remained, the fullest investigation was made; and it failed to disclose anything wrong with Mr. Snelling's accounts. Feeling, however, that suspicion still rested on him, he resigned his post, despite the expressed wish of the Directors that he should stay on. A Committee of prominent townsmen who believed in his innocence, was formed for the purpose of investigating the matter; but they were unable to secure any material evidence. To make matters worse, they were handicapped by the fact that anxiety and worry had resulted in Mr. Snelling being laid up by an attack of congestion of the brain, which for some time endangered his life. Meanwhile, Pearce was appointed Manager; but he did not hold the post long, and in 1893 vanished from the locality. Mr. Snelling recovered from his illness; but his life was ruined. Now, however, his name has been completely cleared; and he has discovered that all his troubles were originated by the orphan he befriended.

A letter has reached him from Saskatchewan, Canada, written by Pearce, in which he says that it was to cover his own faults that he had anonymously accused Mr. Snelling. "I write this as a duty before God," he adds; "and I am sorry for having been guilty of anything so mean. But the influence of Satan had fast hold of me; and I believe I would have done you all the injury I could. I hope you will forgive me."

Birmingham Prepayment Meter Thieves Sentenced.—At the Birmingham Quarter Sessions, Arthur Grafton and Arthur Gardner were indicted for burglariously entering a dwelling-house and stealing 1s., "the moneys of the Lord Mayor, aldermen, and citizens of the city of Birmingham." Prisoners were seen by the police to enter the cellar of the house in question; and it was subsequently found that the slot-meter box had been broken open. It was stated that the prisoners (who were found to have a number of pennies in their possession) had been engaged in this class of crime for some time. The Assistant-Recorder said he would recommend the prisoners to be dealt with under the new Borstal treatment. In order that they might derive the full benefit of this system, he would send them to prison for eighteen months with hard labour.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Regarding the occurrence in connection with the gas supply in Dundee on Thursday of last week, the "Dundee Advertiser" of Tuesday last says that the matter engaged the attention of the Corporation Gas Committee on the previous day, and that a report upon it by the Manager was submitted. It seemed that the cause of the trouble was the admission of an undue quantity of air into the gasholders. Further, it transpired that on the day in question 24 retorts had been put out of operation. For the diminished load, due allowance was not made in working the exhausting mechanism, with the result that, owing to the abnormally high vacuum, air found its way into the holders. It was also shown that in the meter-house an instrument employed for testing the illuminating power of the gas before it passes into the holders had given readings very far below the normal. The Manager, who was engaged at the gas office in Commercial Street at the time of the occurrence, stated that he had made inquiries into the matter, and found that at three, four, and five o'clock the readings were given as zero, instead of 12, which is about the standard. In the Committee there was some discussion and explanation of the technical points at issue, and a general insistence that the matter should be investigated to the bottom. There was talk about personal responsibility for an occurrence which tended to shake public confidence in the gas-works. In the end, it was resolved to adjourn consideration, and that a visitation, for purposes of further inquiry, should be made by the whole Committee to the works. This visit took place yesterday. The Committee inspected the works, particularly the retort, exhauster, and meter houses, and they also examined the employees said to have been implicated in the breakdown. They gave their approval to all that had been done by Mr. A. Yuill, the Manager, including the superseding of the man in charge of the meter-house, and the installation of a self-recording pressure-gauge in the exhauster-house.

In the Glasgow Town Council on Thursday, Mr. Alston asked if the Convener of the Gas Committee could inform the Council as to the cause of the serious loss of gas from the No. 2 gasholder at the Provan Gas-Works, amounting to about 2 million cubic feet, on Friday, the 8th inst., and if he could state whether that holder was the same as the one found to be defective before being used, on its being completed and handed over by the Contractors. Bailie M. W. Montgomery, the Sub-Convener, replied that none of the holders had ever been defective. The cause of the loss of gas, so far as could be ascertained, was that the lute became unsealed by the water syphoning out through the steam-pipe used for keeping the water free from ice. This is quite instructive, as what happened at Provan may happen elsewhere. The danger will be noted, and means taken to prevent a recurrence of the incident. As to the insinuation that one of the two large holders at Provan was found to be defective, the statement, as Bailie Montgomery said, was not accurate. What happened was that the tank of one of the holders—No. 1—leaked after it was filled; but the Contractors put it in order before they handed it over. I was asking about this the other day, and was informed that it was perfectly tight now.

At their meeting this week, the Town Council of Arbroath had before them a statement prepared by the Gas Manager showing the extra sum charged per 1000 cubic feet for gas supplied through prepayment meters in a large number of towns in Scotland. The Gas Committee observed from this statement that there was a very great divergence in the rates charged. They found that in one or two towns the charge was lower than in Arbroath; but in a considerable number of cases the difference was much greater than in that town. On the whole, they were satisfied that the Arbroath charge was moderate and below the average, and they agreed that the present difference in price—5d. per 1000 cubic feet—should be continued. The Manager submitted to the Committee a further report, in regard to the introduction into the gas-works of machine stoking. He and the Convener had visited Alloa and Dunfermline, where very complete plants, upon different systems, have been introduced. The plant in use at Alloa had cost £1800. It was not, however, complete, and it was proposed to erect further plant for dealing with the removal and storage of coke. At Dunfermline, the plant was most complete; and the probable cost of introducing the system into the Arbroath works would be about £3000. According to the figures submitted by the Manager, there would be some saving by the introduction of machine stoking, although it would entail a large initial outlay; but the Committee were of opinion that the subject should have more consideration, and they agreed to let it lie over for the present.

A Sub-Committee of the Cleaning and Lighting Committee of the Edinburgh Town Council have agreed to recommend that a room be fitted up in the City Chambers for the testing, by the City Analyst, of the illuminating power of the gas and electricity supplied. The same Sub-Committee had under consideration a proposal to extinguish every alternate incandescent gas-lamp at midnight; but as this would necessitate a rearrangement of the lighting staff, the subject was referred to the Inspector of Lighting for a report. It is stated that the city is now within 1000 lamps of being lighted, so far as gas is concerned, solely by incandescent burners.

It will be recollected that, after much discussion, of a heated nature, upon the question of whether or not a railway siding should be made into the gas-works, the Corporation of Hamilton (themselves in favour of the scheme) agreed to take a *plébiscite* of the ratepayers, and to abide by their decision upon the subject. This was taken about the beginning of May last. It resulted most unsatisfactorily, as all appeals do, only 2360 ratepayers out of 6109 having returned their cards. The decision of those who voted was against the construction of the siding, by 1204 votes to 1154; and the scheme was dropped. It has, however, been revived by the Gas Committee. This week they submitted a minute to the Town Council, in which they stated that they had considered the question of the annual payment of £100 for wayleave and feu duty for the proposed gas-works siding, and recommended, by a majority, that the siding be proceeded with; that instructions be given for the preparation and issuing of schedules for the work; and that power be given to the Committee to carry out the work. This minute gave rise to fierce discussion. The question having been settled so recently, it was considered to be unfair to the opponents of the scheme that it should be revived so soon, and that it should be sprung upon the Council in the way it had been. On the other side, it was contended that the Council, having to pay the £100 a year, might have the benefit of the siding; and it was maintained that a railway siding would have been the means of earning a profit of £200 in the course of the current year. However, to remove the appearance of the Gas Committee having taken advantage of the Council, they agreed to the matter being recommitted for further consideration.

The electrical equipment of the town of Ayr broke down sadly this

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 458.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. '4	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- 10 p.c. P.	28—29	..	4 16 7
51,810	10	,,	7	mouth Gas B 7 p.c.	17—17½	..	4 0 0
53,200	10	,,	6	and Water Pref. 6 p.c.	15—16	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	262—267	..	4 13 8
300,000	,,	,,	9⅜	Do. New	200—205	.	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	232—237	..	4 14 11
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Aug 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4½	Do. do. 3½ p.c.	91—94	.	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9½	..	4 14 9
50,000	50	Nov. 12	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	108—111	..	4 10 1
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	125—128	+1	5 1 7
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
45,000	,,	Jan.	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	Jan. 31	11	European, Ltd.	24½—25½	+½	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4,⅝	Gas- 4 p.c. Ord.	95½—96½*	..	4 11 4
2,600,000	,,	,,	3½	light 3½ p.c. max.	88—90*	..	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	106—108*	+½	3 14 1
4,193,975	,,	Dec. 13	3	Coke 3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	181—184	..	4 7 0
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95*	..	3 13 8
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	109—111	+1	3 12 1

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	167½—163½	..	4 3 1
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147*	+¾	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3¾	Monte Video, Ltd.	11½—12½	..	5 12 0
1,775,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	110—111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c	20—21	..	4 15 3
55,940	1	,,	7	Do. 7 p.c	13½—14½	..	4 16 7
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6⅛	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅜—8¼	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	—¼	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	124—126	—¼	4 7 4
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—126	..	3 19 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	10,—112	..	4 9 3
120,000	Stk.	Aug. 30	6½	Tottenham A 5 p.c.	12,—130	..	5 0 0
398,940	,,	,,	5	and B 3½ p.c.	1 4—106	..	4 14 4
137,200	,,	Dec. 28	4	Edmonton 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.	106—108	..	4 12 7
30,000	Stk.	Feb. 14	8	Wands- A 5 p.c.	—	..	—
255,636	,,	,,	6⅜	worth B 3½ p.c.	138—143	+1¼	4 10 11
75,000	,,	,,	5⅝	and C 3½ p.c.	111—113	+¾	4 19 1
79,416	,,	Dec. 28	3	Putney 3 p.c. Deb. Stk	79—82	..	3 13 2
845,872	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	104—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.	122—125	..	4 0 0
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

week. On Thursday evening, about eleven o'clock, a water-pipe burst at the corner of High Street and Carrick Street, which had the effect of flooding a transformer chamber at the foot of Wallace Tower. The fuses gave way in consequence, and the street arc lamps failed over a considerable part of the town. The chamber was quickly freed of water yesterday morning; but it could not be dried soon enough to admit of its being utilized under normal conditions. When darkness came on last night, it was sought to get over the difficulty by putting the various parts of the town supplied through the Wallace Tower transformer on to other circuits, with the result that the extra load destroyed the fuses, and about 100 public arc lamps were unlighted. The streets throughout the town were almost destitute of light till nine o'clock. The whole district north of the river was entirely without light, neither arc nor incandescent lamps being available. On the south side of the river, those who were on the direct current had their usual supply of light; but those on the alternating circuit were without any.

An explosion of gas occurred on the evening of Saturday last in the shop situated at No. 519, St. Vincent Street, Glasgow, occupied by the St. George's Co-operative Society. Two plate glass windows, and the glass panel of a door were blown out into the street. No one was injured. The manager of the establishment was conscious of a smell of gas shortly before the explosion; and he was of opinion that the gas had escaped from a leak in a gas-stove at the back of the shop.

The Corporation of Dumfries have agreed to the holding of an exhibition of gas cooking, heating, and lighting appliances, on condition that the promoters do not canvass consumers who are already provided with gas-stoves.

The ordinary general meeting of the Coatbridge Gas Company was held on the 7th inst., when the Directors reported that the accounts for the six months ending Dec. 31 last were satisfactory. The sales of gas were still largely on the increase; the total consumption for the period covered (including about 2 million cubic feet for motive power at the special rate) amounting to 83,917,288 cubic feet, which was an augmentation of almost 5½ millions in comparison with the corresponding period of 1905. There had been increases of 243 in the number of ordinary and prepayment consumers, and of 320 in the number of cooking and heating appliances hired out, during the half year. The gross revenue was £14,028; and though the rates for gas were reduced at the commencement of the half year, there was sufficient profit to permit of the payment of dividends (as prescribed by sliding-scale) at the rate of 11½ per cent. per annum on the original stock, and 8·2 per cent. per annum on the various issues of £10 shares, less income-tax, and the addition of £200 to the reserve.

On Thursday evening, a concert, in aid of the funds of the Granton Gas-Works Sick Benefit Society, was given in the Music Hall, George Street, Edinburgh. There was an attendance of 1300 persons. The concert was held under the patronage of the Lord Provost of Edinburgh, the Provost of Leith, and of the Edinburgh and Leith Gas Commissioners. A highly appreciated programme was gone through.

On the evening of Friday, the 8th inst., the employees in the Kilmarnock Corporation Gas-Works held their annual social meeting in the Art Galleries of that town. Tea was served to about 180 persons. Ex-Bailie R. Muir, the Convener of the Gas Committee, presided. A large number of town councillors and officials, including the two Gas Managers—Messrs. W. & C. Fairweather—were present. A very happy evening was spent in song and recitation, after which dancing was engaged in till four o'clock in the morning. The Chairman, in the course of some speaking which took place, said that the gas consumption last year was greater than in any previous year; and the Committee had made up their minds that they would still further increase the consumption, by encouraging people to use gas-cookers, which they were supplying on very favourable terms. They had now 700 in use, and more were going out every week. They intended to go a step further, and to hire out gas-fires also. He might tell them that if the gas undertaking had not had to bear the burden of a deficiency in connection with the electric light, the price of gas, instead of being 2s. 8½d. per 1000 cubic feet, would have been reduced to 2s. 6d. The new gas-works were now completed, and were giving the greatest satisfaction. A pleasing feature of the undertaking was that the whole indebtedness—including both the old works and the new—was little more than the amount the Corporation paid for the old worn-out works 35 years ago. At that time the consumption of gas was only about one-sixth of what it was at present. The indebtedness on the works was about £55,000, and they were making over 170 million cubic feet of gas every year. He did not think they would find a parallel to that anywhere. He knew of places where, with almost a similar consumption, the indebtedness was as high as £180,000. He did not think the Corporation had anything to fear, so far as the gas-works were concerned. "Success to the Gas-Works" was proposed by Councillor Watson, and was responded to by Mr. W. Fairweather. He was glad to say that he had a set of good, honest, steady men, who attended faithfully to their work.

Exmouth Water Supply.—At the last meeting of the Exmouth Urban District Council, it was decided to apply to the Local Government Board for power to borrow £5763 for the improvement of the water supply. The proposed works include a reservoir and filter-beds for the supply of the high-level district, with the necessary mains, &c. The scheme has been designed by the Surveyor (Mr. S. Hutton), and has the approval of Mr. Strachan.

Supply of Free Washers for Taps at Croydon.—At a recent meeting of the Water Committee of the Croydon Town Council, it was recommended that washers should be supplied and fitted to leaky taps free of charge, at any rate for twelve months. Mr. King, who moved that the suggestion should be carried out, said the washers only cost 1d. or 2d. apiece—the amount involved being only about £12. Mr. Mabey moved, as an amendment, that the words "free of charge" be deleted, as he did not see why the work should be done for nothing. The Town Clerk said the Council could not legally impose such a charge. Mr. Stewart remarked that they were not prepared to set up a municipal plumber's shop in Croydon. The amendment was lost.

TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

For the

RAPID AND ECONOMICAL

HANDLING OF COAL & COKE

AT

Gas-Works, Electricity Generating Stations, &c.,

BY MEANS OF GRABS OR PATENT AUTOMATIC DUMPING BUCKETS.

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Telephone: 365 LONDON WALL.
Telegrams: "TRANSUMO, LONDON."

NO BREAKAGE OF COKE if you use Temperley Transporters.

CURRENT SALES OF GAS PRODUCTS.

Week ending Feb. 16.

The London market for tar products has been very steady. There is a good inquiry for pitch; and the improvement in the value of this article is maintained. Shipments continue to be very heavy; and stocks are accordingly unusually light. Ninety per cent. toluol is worth 1s. 2d. to 1s. 2¼d. net. Naphthalene is in demand; but prices will have to improve before manufacturers can be induced to produce this article. Sulphate of ammonia is without change.

LIVERPOOL, *Feb.* 16.

Sulphate of Ammonia.

There has been nothing special in the market upon which to comment. Available parcels continue to find buyers, but competition for them has become less keen, and there has been no further improvement in values. The closing quotations are consequently £11 17s. 6d. per ton f.o.b. Hull, £12 to £12 1s. 3d. per ton f.o.b. Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. Home demand has been restricted, inclement weather having delayed agricultural operations. There has been no alteration in the forward position. The large makers are rather fully sold at high prices, and the smaller makers are not concerned to sell ahead unless at a substantial premium on spot values. On the other hand, buyers are hanging back for the chance of doing better.

Nitrate of Soda.

This article has assumed a firmer tone, and spot prices have been advanced to 11s. 6d. and 11s. 9d. per cwt. for 95 per cent. and refined qualities respectively.

LONDON, *Feb.* 16.

Tar Products.

Markets have been fairly well maintained during the past week. Pitch remains steady; but there does not appear to be quite so much demand as was the case a week ago, which may be owing to the fact that buyers have now covered their requirements for the time being. Business is again reported to have been done at 25s. on the east coast to June, and there is probably a fair quantity still to be sold for this delivery. On the other hand, some of the manufacturers are now quite comfortable, and will not entertain anything like such figures. On the west coast, 24s. has been accepted for delivery to the end of June; while business has been done at 23s. 9d. at Manchester, and 24s. 6d. at Liverpool. Creosote is steady. Some quantity of outside London makes could be secured at a fairly reasonable price; but the principal London makers are well sold, and do not care to quote. In the Midlands, oil is exceedingly scarce, and high prices are asked; while in the North, manufacturers are fairly well sold, and quite prepared to wait before placing any further quantity. Benzol, 90 per cent., is decidedly quiet. Some quantity was offered for sale in the Midlands at 8½d. into buyers' packages without success; while business is said to have been done at under 10½d., casks included, upon the east coast. In London, manufacturers appear disposed to sell at a reasonable figure, but there is a decided scarcity of orders for the moment; and country makes are reported to have been sold on rails London at 11d. per gallon. There is little offering in 50-90 per cent., which is steady. In toluol, makers are well sold, and will not entertain business except at good prices; while consumers do not seem anxious to buy for the time being. Solvent naphtha is decidedly firm, especially in London, and for the finer qualities very high prices are reported to have been paid for 95 per cent.; while ordinary 90 per cent., actual London make, continues to fetch good figures. In the country, prices are fairly well maintained; but there have been sellers at reasonable figures at certain ports upon the east coast. There is no change in carbolic acid, and values remain the same; both Continental and English consumers refusing to improve upon their previous offers, which makers at present will not entertain. There is not much doing in crystals; but small orders continue to be taken from time to time at current market prices.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 25s. to 25s. 6d.; east coast, 25s.; west coast, 23s. 9d. to 24s. 6d. Benzol, 90 per cent., 10½d. to 11d.; 50-90 per cent., 11d. to 11½d. Toluol, 1s. 1½d. to 1s. 2⅝d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1⅜d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2⅛d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £6 to £10; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market for this article is steady, though in London it is reported that very low prices have been accepted under tender. The principal London Gas Companies maintain their quotation of £12 5s. for February-June; but other makes could be secured at considerably under this figure. In Hull, business has been done at £12 for prompt, and £12 2s. 6d. for February-April. In Leith, £12 1s. 3d. was offered for prompt delivery without success; and the buyer finally paid £12 2s. 6d., thus establishing the value at this place. In Liverpool, business has been done at £12 and £12 2s. 6d. for good grey; but discoloured makes have been sold at considerably under these figures.

New Issues of Gas and Water Capital.—By announcements appearing in our advertisement columns, our readers have been informed that the Croydon Gas Company are about to sell by tender £25,000 of "D" 5 per cent. stock, at a minimum price of £107 per £100. Tenders are to be sent in by the morning of the 6th prox. Next Friday, Messrs. T. Martin and Sons, of Exeter, will offer for sale by auction 150 additional £10 ordinary shares and 200 preference shares (5 per cent.) of the same nominal value in the Crediton Gas Company. The ordinary shares are entitled to a dividend up to 7 per cent., subject to the sliding-scale. On Thursday, Mr. Atkinson Gibson will sell by auction additional capital stock of the Sunderland and South Shields Water Company to the nominal amount of £30,000, entitled to a minimum dividend of 5 per cent.

SAWER & PURVES

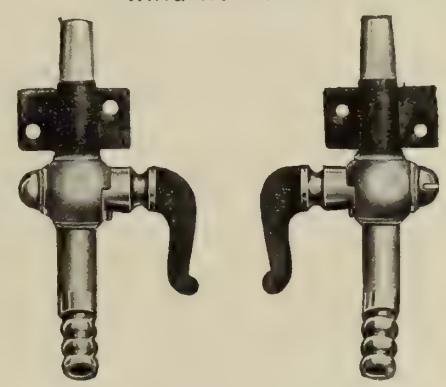
Stove Fittings.

STOVE BEND.



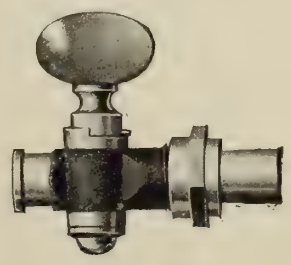
No. 112.

WING HOB TAPS.



No. 114.

STOVE TAP.



No. 110.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Reports from all the mining districts of the county show the most active business in all sections of the coal trade. Stocks of steam coal have long ago disappeared, and supplies can only be got direct from the pits. House coal, too, is in much the same position, and difficult in some quarters to obtain. More coal is being exported. The increase last year by the Ship Canal was no less than 222,000 tons. The demand for gas coal and cannel shows slight signs of easement. Delays in transit and lack of returns of coal-trucks by railway companies are complained of. The average quotations at the pits are as follow: Best house coal 14s. 6d. to 15s. 6d. per ton, secondary 13s. 6d. to 14s. 3d., common 10s. to 12s. 6d., burgy 8s. 10d. to 9s. 6d., best slack 8s. to 9s., medium 7s. 6d. to 8s., common 6s. 9d. to 7s. 3d., shipping 10s. 6d. to 11s. 6d., coke for furnaces 17s. to 24s. For some of the better classes of coal, higher prices than the above are charged at the pit's mouth. At four local collieries, the charges for best selected house coal are 16s. 8d. per ton, Trencherbone at four pits 15s., shuttle riddled 14s. 2d., four-feet 13s. 4d. and 14s. 2d., riddled 11s. 8d., burgy 10s. 10d. and 11s. 3d., nuts 13s. 4d., slack 9s. 7d., and washed slack 10s. 5d. At Manchester and Salford wharves, some of these prices are exceeded. Progress with new mines in the Midlands is reported. Trade in South Yorkshire coal is stated to be brisk, both for home consumption and for export.

Northern Coal Trade.

While in some quarters it is thought that the highest price has for the present been reached in the coal trade, there is still great general activity in it, with full shipments; and an exceedingly strong demand continues. The fact also that many collieries have booked orders well on into the spring makes the prospect hopeful. In the steam coal trade, best Northumbrians are now tolerably steady at 15s. per ton f.o.b., second-class steams are 13s., and steam smalls rather brisker at from 7s. 9d. to 8s. 9d. The pits seem to be working well; and this must be expected to continue. In the gas coal trade, there is now a rather less home delivery; and the milder weather should tend further in this direction. More of the foreign contracts, however, are being placed; so that the exports of that class of coal should increase. High prices are quoted—from 12s. 3d. to 13s. per ton f.o.b. being a current quotation; while in some cases, higher values are spoken of. One or two contracts—for Malmo and Kiel for instance—have been booked; but the quantities are not large. The prices agreed upon are on a somewhat similar basis to that of the Stockholm contract previously named, and show the same substantial advance on last year's figures. In the coke trade, the demand is fair, and gas coke benefits—stocks of the latter are sometimes small, and production is less. Good gas coke is quoted from 13s. 6d. to about 14s. 3d. per ton f.o.b.

Scotch Coal Trade.

The market is still rising. There is a great demand for coal, for consumption both at home and abroad. Outputs are being easily disposed of. Shipping to the Baltic and other northern ports is about to be resumed for the season, in anticipation of which further advances are looked for. The prices quoted are: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. to 12s. 6d., and steam 11s. 3d. to 11s. 6d. The shipments for the week amounted to 268,526 tons—an increase of 9269 tons upon the previous week, and of 15,938 tons upon the same week of last year. For the year to date, the total shipments have been 1,325,507 tons—an increase of 43,096 tons upon the corresponding period of 1906.

The Proposed Gas-Coal Combination.

Reverting on Thursday to their previous remarks on the subject of a gas-coal combination (which were noticed on p. 424 of last week's "JOURNAL"), the "Sheffield Daily Telegraph" say: "An arrangement has been entered into between colliery owners in Yorkshire, Lancashire, Derbyshire, and Notts with a view to so lifting contract prices for gas coal that a portion of the large profits now being earned by gas companies in all parts of the country shall be transferred to the colliery owners' pockets. We may add that the separate districts mentioned have all previously had their own organizations, and these will remain; but as competition between the various producing centres has hitherto been of an almost ruinous character, the present arrangement embraces, as its chief feature, the formation of a central body consisting of delegates from the District Associations who shall jointly fix the minimum prices for each area. What is more, the spirit of combination is being entered into with great earnestness. When we first mentioned the matter some four or five weeks ago, it was thought that if by the means now to be employed an additional 2s. 6d. per ton for gas fuel could be obtained, the new Association would fully justify its existence. It now seems evident that producers will not be satisfied with any such increase; and the view is taken that 4s. to 5s. per ton advance is more likely to be the result. A good deal, of course, will depend on the state of the coal trade on the North-east coast, and the demand for gas coal from the Continent. Until last year, the large London Gas Companies obtained practically the whole of their supplies from Durham; but the high rates ruling there last May diverted much of the business to our own district, and a small consignment was even received from the Continent. That the Durham people desire to run with the hare and hunt with the hounds, as it were, is to be inferred from the communication made to the Press by Mr. Reginald Guthrie, Secretary of the Durham Coal-Owners' Association." [This letter will be found on another page.—ED. J.G.L.]

Sales of Shares.—At a recent auction sale, fourteen new ordinary (1884 issue) 7 per cent. fully-paid £12 10s. shares in the Salisbury Gas Company realized, *ex div.*, from £18 17s. 6d. to £19 each. Messrs. King and King recently offered for sale 2000 additional £5 shares (5 per cent.) in the Portsmouth Water Company. They were put up in 400 lots, and the majority fetched £6 5s. each, though a few realized £6 7s. 6d. The sale produced about £12,600.

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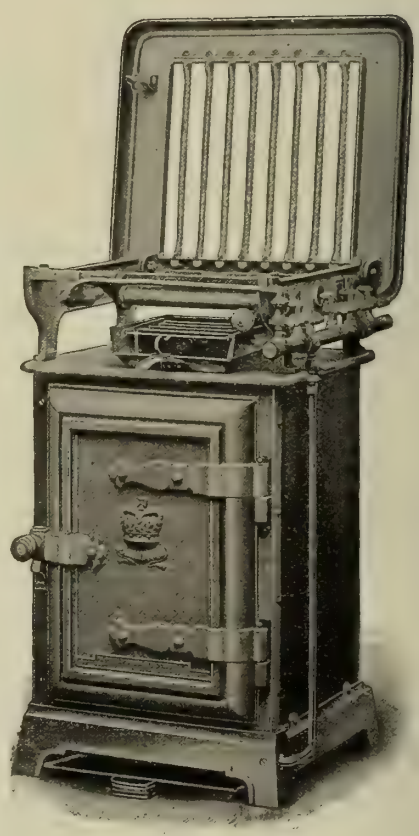
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West Ham Corporation and the Sulphur Restrictions Bill.

At the meeting of the West Ham Corporation last Tuesday, the Legal and General Committee reported that they had received a communication from the Borough Solicitors on the subject of the Gas Companies (Removal of Sulphur Restrictions) Bill. Mr. W. C. Young, the Council's Gas Examiner, had been consulted by the Committee in regard to the proposals of the Bill, so far as they affected the borough in connection with the West Ham Gas Company, and he stated that, having regard to the fact that all the Metropolitan Gas Companies (two of which supply gas in the borough), and many of the Suburban and Provincial Companies, had been relieved of these restrictions, and that the Departmental Committee appointed by the Board of Trade reported strongly in favour of their removal; and, further, that no complaint had been made by consumers of the extra sulphur in the gas in places where the restrictions had been abolished or had never been in force, he did not think any effective opposition could be presented to the Bill by the Council. He therefore advised the Council not to oppose. It was accordingly resolved that no petition should be presented with regard to the Bill.

Gas Profits at Walsall.

The report of the Walsall Gas Committee, dealing with the working for the twelve months to Dec. 31, which has been adopted by the Town Council, showed a net profit of £8658, out of which it was proposed to contribute £6000 in reduction of the borough rate. Mr. Turner, who presented the report to the Council, said that the profit earned had only been exceeded on two previous occasions; the largest figure having been £9911 in 1894. The total amount of gas made was 480,186,000 cubic feet, or an increase of 14,813,000 feet. The coal carbonized was 45,600 tons, against 45,918 tons the previous year; but the yield of gas per ton was 10,533 cubic feet, as compared with 10,124 feet. There had been a reduction of £1059 in the cost of coal, and of £440 in purifying. The reduction in the price of gas for power purposes had been justified by an increase of 11 per cent. in the demand. In spite of keen competition, the gas undertaking remained the premier concern for power and lighting purposes. The Committee expected that this year their profits would be affected by the necessity for paying more for coal. Mr. Venables remarked that the advance in coal prices would probably represent a loss to the Committee of from £2000 to £3000. Alderman Hughes pointed out that the Committee made their profit by keeping up the charges; and Mr. Halford urged that the price of gas for manufacturing purposes should be still further reduced.

Large Ratepayers who Cannot Vote.

Meetings of three of the most important Railway Companies in the country—the London and North-Western, the Great Western, and the Great Northern—were held on Friday; and at each of them reference was made to the subject of increased rates. At the meeting of the first-named Company, the Chairman (Lord Stalbridge) said that, in London in particular, the rates had gone up by leaps and bounds; but they had now a great opportunity of looking after, not only their own, but also the general interests of ratepayers. The Company's rates and taxes had increased in the last ten years from £368,424 to £603,530, or by £235,106, and they were now equal to £1 8s. per cent. per annum of the dividend on the ordinary stock. Perhaps the best way of showing the proprietors the seriousness of the matter was by supposing that the rates and taxes were deducted from their dividend in the same way as the income-tax. At present 1s. in the pound was taken off for income-tax; but the rates and taxes would amount to 4s. 5d. in the pound. At the Great Western meeting, Mr. Alfred Baldwin, M.P., who presided, referred to the same subject, and pointed out that the rates and taxes were higher in the past half year by £11,598, of which about £7000 was due to poundages. At the Great Northern meeting, while Lord Allerton was able to congratulate the shareholders on a reduction of £4000 in the sum paid for rates and taxes, he was careful to point out that this was the result of the victory the Company had won in the matter of assessments, as the poundage was still constantly increasing.

New Joint-Stock Companies.—The English Gas-Mantle, Limited, has been registered with a capital of £50,000, in £1 shares, to adopt an agreement with the Dura Incandescent Mantle Company, Limited, and F. S. Salaman, and to carry on the business of manufacturers and importers of, and dealers in, incandescent gas-mantles. Under the title of Ecliptic Gas Light, a Company has been registered, with a capital of £10,000 in £1 shares (2100 "A" and 7900 "B"), to take over the business of manufacturing globes and fittings in connection with gas lighting, and of buying and selling gas-meters, carried on by Mr. George Helps at premises in Bond Gate, Nuneaton, together with the rights secured by the vendor in certain inventions. There will be no initial public issue.

Public Lighting at Devonport.—Reference was made at the meeting of the Devonport Town Council on Thursday to the question of the improved lighting of the principal streets. The Joint Lighting Sub-Committee reported that they had considered the reports of the Gas Engineer and the Electrical Engineer as to the lighting of streets where the electric cables are now laid, and recommended that such streets (other than Fore Street) be lighted with incandescent gas, as advised by the Gas Engineer. Sixty-four incandescent lamps of 420-candle power (three burners) are to be used, at a cost of £6 4s. 8d. per lamp; being a total annual cost of £399. When the subject was reached at a late hour, it was intimated that there would be a good deal to be said about it; and it was suggested that the standing orders putting a time limit to members' speeches should be suspended. The Mayor said he thought it would be better to devote a special meeting to the subject; and it was agreed that this should be done—the Mayor promising to call the meeting at an early date.

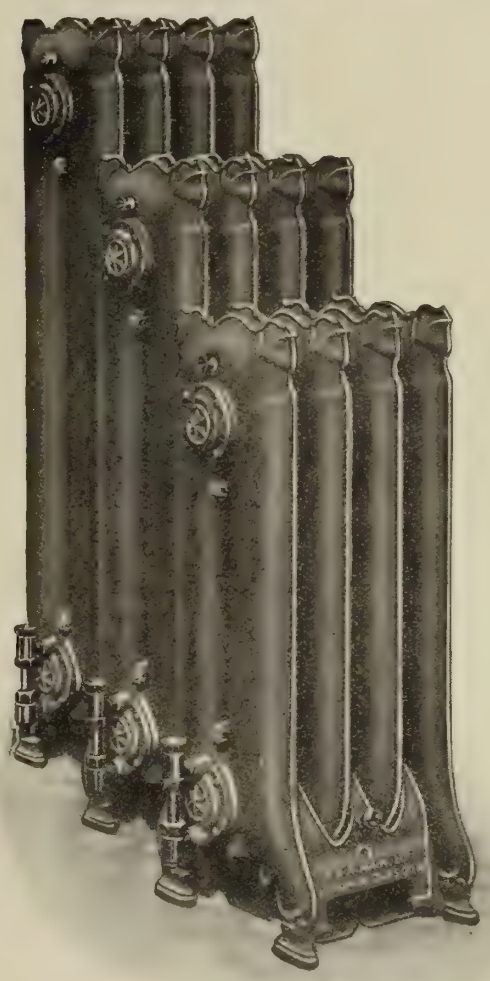
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Extension of the Cheltenham Water-Works.—The Cheltenham Town Council, who, in addition to their own borough area, supply the town of Tewkesbury with water, have decided to spend an estimated sum of £4000 on new pumps at the Tewkesbury works, and an additional £1000 on necessary alterations to the buildings, foundations to engines, well work, &c.

Ryde Water Supply.—At a cost of £1300 the Water Committee of the Ryde Town Council have laid water-mains to increase the pressure in the St. Helen's district, the demands for water in which have now increased from 1,594,000 to 17,629,000 gallons. It has been explained that but for supplying other districts Ryde would be paying a water-rate, which they have not done for four or five years.

Chard Water Supply.—After more or less consideration of the subject for about eight years, the Water Committee of the Chard Corporation have come to the conclusion that the proposal to obtain a supply of water by gravitation from the neighbouring parish of Buckland St. Mary is not feasible. At a meeting of the Town Council last Wednesday, it was decided to rescind a resolution passed in 1899 instructing the Committee to carry out a gravitation scheme. An estimate will now be prepared of the cost of providing water by pumping.

The Bland Light.—Messrs. Bland and Co. are to supply the Gaslight and Coke Company with their No. 11 inverted burner for the purpose of lighting the forthcoming Furnishing Exhibition at Earl's Court. Messrs. Bland have received from one of the churchwardens of St. Margaret Pattens, Rood Lane, London (in which church their light was recently installed), a letter stating that the installation has been a great success, and everyone is pleased with it. The writer considers the system an ideal one for church lighting, and anticipates a great saving of gas—the number of burners being less than half what it was formerly.

Municipal Electricity at Woolwich.—The Finance Committee of the Woolwich Borough Council were unable to present the new estimates at the meeting last Thursday, owing to financial difficulties; and a temporary overdraft of £55,000 had to be sanctioned to meet present liabilities. Mr. Widger said the new rate would be an increase of 1s. in the pound; and 10d. of this he attributed to loss on the electrical undertaking, which the Labour party ceased to control last November. The deplorable results of the arrangements made by the Progressive-Socialist majority respecting the electricity supply were shown in the report presented by the Electricity Committee. Mr. T. Ingram, the Chairman of the Finance Committee, said of the £60,000 overdrawn at the bank, £42,000 related to the electricity account. The Council decided to close the wiring department from the 31st prox., and to sell the stores they have in hand. It was stated that the loss on the electricity undertaking would be responsible for a rate of 5d. in the pound.

The Demand for Coke.—At the meeting of the Devonport Town Council on Thursday last, Alderman Littleton said his attention had been called to the fact that a number of small dealers in coke could not get supplies from the gas-works. These dealers hawked coke in the poorest neighbourhoods; and the fact that they could not obtain supplies caused great inconvenience. He did not know whether it was because the Gas Committee had made large contracts; but he thought the small dealers should have a chance. Mr. J. W. Buckley, the Gas Manager, said it was a fact that the Committee entered into certain contracts with reference to coke in the early part of the year. Owing to the use of oil, the quantity of coke available had decreased; and they had of late found it practically impossible to meet all demands. Alderman Littleton thought that if possible some reserve should be kept for the supply of poor people through the small dealers. Mr. Buckley said they had not absolutely cut these small dealers off; and they would do their best to meet their requirements.

Water Supply of South Molton.—The question of improving the water supply of the town was under consideration at a meeting of the South Molton Town Council last Tuesday. A report prepared by Mr. J. Siddalls, Borough Surveyor of Tiverton, stated that the supply was ample and the storage reservoir of sufficient capacity. The trunk main and service-pipes were, however, very much corroded, and ought to be entirely relaid. He also recommended the covering of the service reservoir and the construction of new filters. The present filters were inadequate and defective in construction, with the result that the water was less pure after filtration than before. He estimated at £3200 the cost of the improvements recommended. The Mayor (Mr. J. Sanders) pointed out that this expenditure would only involve an annual charge of £180, and that in a few years they would have £300 per annum from the gas-works. Considerable opposition was, however, shown to the scheme, on the ground that it meant an immediate addition of 5d. in the pound to the rates. It was eventually decided that the report should be considered in committee, with a view to devising means for carrying out the scheme in sections.

Metropolitan Water Board.—At the meeting of the Board on Friday, the Chairman of the Law and Parliamentary Committee (Mr. J. B. P. Karslake) stated that 50 petitions had been presented against the Board's Charges Bill and 54 against their Various Powers Bill. He thought a great deal of the opposition might be settled by negotiation, as a considerable amount of it arose from misunderstanding and from issues which neither of the Bills dealt with. The Works and Stores Committee reported that a letter had been received from the London County Council in regard to an unsatisfactory supply of water on the occasion of a fire which took place on the 5th ult. in Patriot Square, Cambridge Road, E. The inadequate supply of water obtainable from the hydrants in Patriot Square and Peel Grove appeared to be chiefly due to the small size of the mains, which were only 3 inches in diameter. The Committee stated that they had had under consideration a report on the subject by the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.), which pointed out that the hydrants were all fixed at the request and to the instructions of the London County Council or their predecessors. No complaint of short supply or low pressure had been received from any of the Board's consumers; and the Chief Engineer stated that the mains in the district in question were amply sufficient for the Board's purposes. The Committee had accordingly given instructions for the substance of the report to be communicated to the Council.



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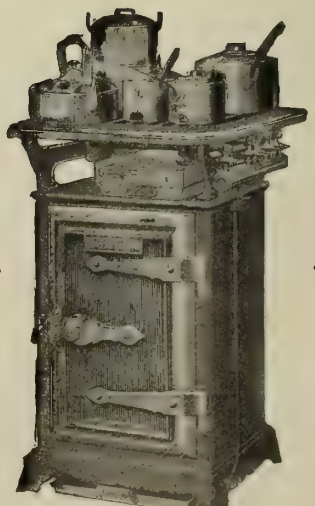
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Price of Gas at Sleaford.—In the report presented by the Directors at the annual general meeting of the Sleaford Gas Company, Limited, last Tuesday, the intention was announced to reduce the price of gas to all consumers by 2d. per 1000 cubic feet as from March 31; making it 2s. 4d. and 2s. 6d. for power, and 3s. for other purposes.

London County Council and the Mitcham and Wimbledon Gas Bill.—At the meeting of the London County Council last Tuesday, the Chairman of the Parliamentary Committee (Mr. W. B. Yates), in reply to a question, stated that the Council were desirous of having clauses inserted in the above-named Bill, and therefore he moved that the necessary petition be sealed and presented against it, and the costs and expenses charged to the county fund. This was agreed to.

Carburetted Water-Gas Plant for Ashford.—The Ashford Urban District Council decided at their last meeting to adopt the recommendation of the Gas Engineer and Manager (Mr. H. R. Turner) to instal a carburetted water-gas plant at their works this year, in order to meet the increased output on the district, and the proposed extension of main to Willesborough. The Local Government Board, owing to the present state of the law, were unable to sanction a loan for this purpose; and it has therefore been decided to spread the cost of the work over three half-yearly estimates.

Biggleswade Water Supply.—It was mentioned in the "JOURNAL" some months ago that a scheme of water supply was about to be carried out for Biggleswade. It has lately been completed; and the event was celebrated by a dinner in the Town Hall. The source is a deep well sunk into the lower greensand formation. Some 70 miles of mains have been laid, and the water has been turned on at the farthest point of distribution—viz., the urban district of Kempston, which is 16 miles from the source. Mr. G. F. Deacon, M.Inst.C.E., was the Engineer. The estimated expenditure was upwards of £80,000; but we understand the scheme was carried out for £10,000 less.

Frost and Water-Pipes.—Figures placed before the Liverpool Water Committee show what an effect severe frost has on the undertaking. For the week ending Feb. 2, the total quantity of water supplied from Rivington, from Vrynwy, and from wells was 227½ million gallons, or 36·37 gallons per head of the estimated population; while for the week ended Feb. 9, the quantity supplied was 36·44 gallons per head. In the corresponding weeks last year, the figures were 183 and 179 million gallons, or 29·54 and 28·92 gallons per head respectively. The increased consumption, it is pointed out, is due to the bursting of pipes—5781 bursts having occurred between Jan. 26 to Feb. 9.

Dartmouth Water Supply.—A report was presented to the Dartmouth Town Council yesterday week, in which Mr. C. E. Newton, of Manchester, described various proposals for increasing the water supply of the town. The idea was to obtain the water from the Old Mill Valley, which comprises a gathering ground of 950 acres, and is estimated to yield a minimum supply of 128,000 gallons per day. Mr. Newton calculated that about 70,000 gallons per day is required in addition to the present supply. Several alternative suggestions were made as to the manner in which the water could be pumped from the valley and stored and distributed. The estimated cost of these schemes varied; but taking the outlay on permanent works at £4500, and on the plant at £1600, the annual amount required for interest and sinking fund would be £350. In addition to this, there would be the cost of the land, and also £175 per annum for pumping. The Surveyor (Mr. T. W. Joyce) presented a report which he had prepared after reading that of Mr. Newton, and suggested a scheme estimated to cost £4880. It was decided that the Council should meet in committee to consider the various schemes, including one prepared by the late Surveyor.

APPLICATIONS FOR LETTERS PATENT.

2709.—LEATHER, J. H., "Pipe-union joint." Feb. 4.
2713.—BULL, J. W., "Gas-cooking." Feb. 4.
2736.—PARKER, E. J., "Burners." Feb. 4.
2737.—PENDREY, J. E., "Incandescent mantle for heating purposes." Feb. 4.
2749.—GOODING, J. H. D., "Gas-burners." Feb. 4.
2776.—WILTON, T., "Approximately ascertaining the quantities of fluids passing through a pipe." Feb. 4.
2791.—JOHNSON, C. J., "Gas-regulators." Feb. 4.
2821.—RIVETT, F., and OLDHAM, S., "Burners." Feb. 5.
2828.—SMITH, A. H., and SHAW, F. G., "Gas plant." Feb. 5.
2859.—EDGE, F. R., "Gas-pendants," Feb. 5.
2919.—PRICE, H. A., and TURNER, H. C., "Cooker-grids." Feb. 6.
2920.—COWPER-COLES, S. O., "Extraction of sulphur from sulphur compounds." Feb. 6.
2935.—SHAW, J. A., "Coal and gas range. Feb. 6.
2938.—DENCH, L. T., "Attaching gas-pipes, &c." Feb. 6.
2981.—WOODALL, H. W., and DUCKHAM, A. M'D., "Discharging inclined or vertical retorts." Feb. 6.
2994.—KARYSCHEFF. A. A. DE, "Refractory materials." Feb. 6.
3016.—BREARLEY, J. H., "Ascertaining the units of heat in air heated by contact with gas-fire stoves." Feb. 7.
3023.—WOLFSON, S., "Burners and mantles." Feb. 7.
3047.—HEBRON, A. F., "Gas-stoves." Feb. 7.
3098.—WILTON, G., "Coke-ovens." Feb. 7.
3101.—AKT.-GES. FÜR SELAS-BELEUCHTUNG, "Inverted lamps." Feb. 7.
3133.—WRIGHT, J. W. B., and DARWIN, H., "Gas-cookers." Feb. 8.
3138.—ROWAN, F. J., and R. & J. DEMPSTER, LTD., "Utilization of the waste heat of the gases obtained from producers and the like." Feb. 8.
3140.—THORP, T., "Rotary gas-meters." Feb. 8.
3204.—WEST, J., "Furnaces and gas-producers." Feb. 8.
3235.—KELVEY, H. E., "Distance gas-lighter." Feb. 9.
3243.—BRUCE, A., "Air-gas plant." Feb. 9.
3270.—JONES, A. O., "Coke-ovens." Feb. 9.
3303.—AKT.-GES. FÜR SELAS-BELEUCHTUNG, "Mixture of gas and air." Feb. 9.

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We understand that Mr. W. T. Sloper has resigned his position with the Davis Gas-Stove Company, Limited, whom he has represented for nine years.

When submitting, at the 31st annual dinner of the Newport (Mon.) Gas-Works Benefit Society, the toast of "The Chairman and Directors of the Company," Mr. J. H. Canning remarked that during the last ten years most of the principal undertakings had revolutionized the process of gas manufacture, lighting, and supply. Incandescent gas-light had superseded the old system; and for a penny as much light could be secured now as could be obtained for 10d. some years ago. Alderman T. Canning, J.P., who presided, said the Chairman and Directors had sent a kind message. "The Mayor and Corporation of Newport" was proposed by Mr. T. Hazell, who pointed out how inimical high rates were to industrial progress. The Society now possess a reserve fund amounting to £247.

A draughtsman in the employ of the Great Western Railway Company was killed at Swindon by an explosion while engaged in the installation of an acetylene gas plant connected with a rifle range.

The Hawick Gaslight Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a complete new retort-bench, consisting of five through arches, with the firm's patent shallow regenerator, complete with foundations, retort-mountings, retort-house governor, &c. The work has to be completed to the satisfaction of Mr. W. A. Smith, the Gas Company's Engineer.

A Brixton hotel was last week the scene of a suicide by means of gas; the victim being a gentleman named Forman, who had for many years represented several important members of Lloyd's. After sleeping at the hotel, he failed to answer when called; and on the door being forced, he was found dead in bed, with a rubber tube from the gas-bracket in his mouth, and a towel wound round his neck.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER. Marple Gas Department. Applications by Feb. 23.
MANAGER. Llandudno Gas Department. Applications by Feb. 28.
TRAVELLER (MANTLES). Laddite Incandescent Mantle Company.
GENERAL FOREMAN. No. 4720. Applications by Feb. 26.
WORKS FOREMAN. No. 4715.
WORKING FOREMAN. Arundel Gas Company. Applications by March 4.
CARBONIZING FOREMEN. No. 4725.
CHARGE OF SHOW-ROOM. No. 4724.
MAIN AND SERVICE LAYER. Horsham Gas Company.
FITTER. Dorking Gas Company.

Situations Wanted.

FOREMAN OR MANAGER. No. 4723.
GAS-STOVE REPRESENTATIVE. No. 4722.

Agency Wanted (Coal). No. 4717.

Plant, &c., For Sale.

ELEVATOR, &c. Blakeborough and Sons, Brighouse.
ENGINE AND EXHAUSTER. Mansfield Gas Department.
PIPES AND TANKS. No. 4721.

Stocks and Shares.

BISHOP'S STORTFORD GAS COMPANY. Feb. 26.
CHERTSEY GAS COMPANY. March 12.
CROYDON GAS COMPANY. March 6.
HAMPTON COURT GAS COMPANY. March 12.
LEA BRIDGE GAS COMPANY. March 12.
SOUTHEND GAS COMPANY. March 12.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 21.
TAR (PATENTS) SOLIDIFYING AND DISTILLING COMPANY.
UXBRIDGE GAS COMPANY. March 12.

Company Meeting.

CRAYS GAS COMPANY. Library, St. Mary Cray. Feb. 27. 6.30 o'clock.

TENDERS FOR

Chimney Stack.
BRECON GAS COMPANY. Tenders by March 6.

Condensers, &c.
BRECON GAS COMPANY. Tenders by March 6.

Fire-Clay Goods.
BRECON GAS COMPANY. Tenders by March 6.
CLACTON GAS DEPARTMENT. Tenders by March 6.
DUNEDIN (N.Z.) CORPORATION. Tenders by June 19.

Gasholder.
DUNEDIN (N.Z.) CORPORATION. Tenders by June 19.

Iron and Steel Work (Wrought and Cast), &c.
DUNEDIN (N.Z.) CORPORATION. Tenders by June 19.

Oil for Gas Making.
CARLISLE GAS DEPARTMENT. Tenders by March 4.

Oxide of Iron.
CARLISLE GAS DEPARTMENT. Tenders by March 4.

Purifiers and Shed, &c.
BRECON GAS COMPANY. Tenders by March 6.

Retort-Bench, &c.
BRECON GAS COMPANY. Tenders by March 6.
CLACTON GAS DEPARTMENT. Tenders by March 6.

Tar and Liquor.
CARLISLE GAS DEPARTMENT. Tenders by March 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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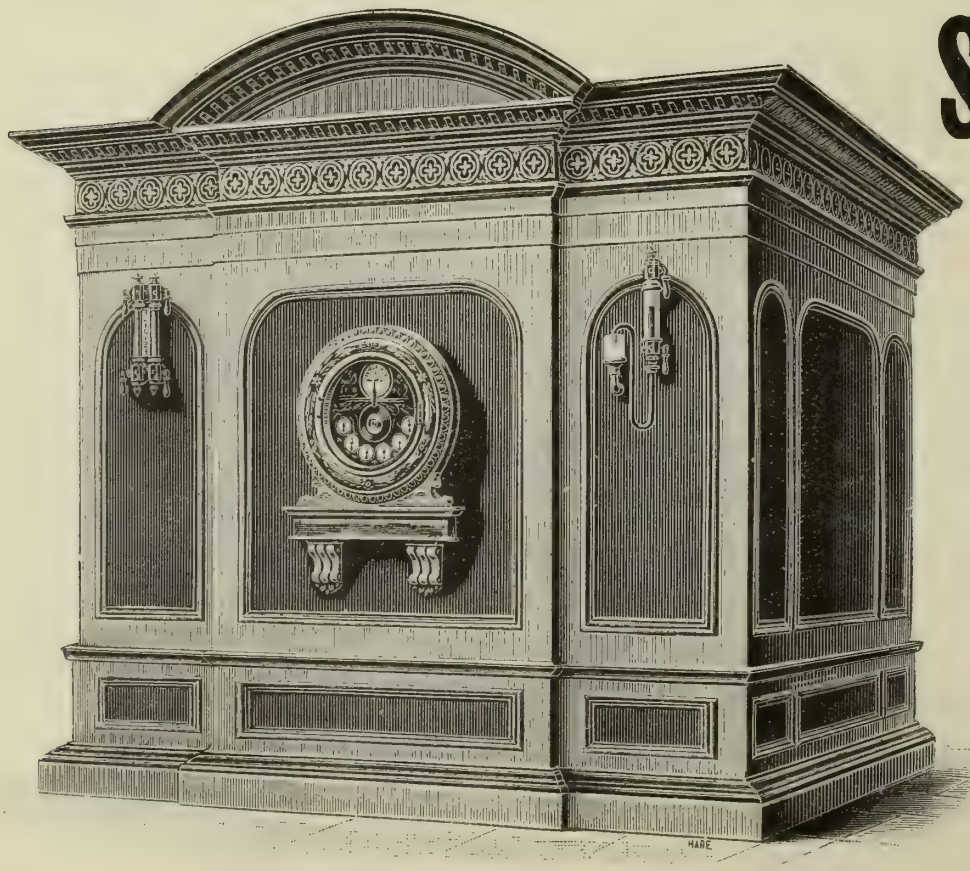
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VOL. XCVII., No. 2285.—TUESDAY, FEBRUARY 26, 1907.

EDITORIAL NOTES—GAS, &c.

The Gas Coal Position.

If the reports from the several coal districts are pieced together, it is as manifest as anything can be that a dead-set is being made against gas coal purchasers by colliery proprietors; and the gas industry has to face that hard fact, and not allow themselves to be cajoled by bland negation into the belief that the idea is the offspring of deceptive appearances. The existence of local associations of coal owners is no new thing; and such associations are of the first importance to them in the cause of protection apart from the question of price. But hitherto there has been fair and open competition for contracts between district and district. And when one district has endeavoured to permanently raise the level of prices, those endeavours have been neutralized (to use the expression of a coal contemporary) by severe competition from other quarters. This severity of competition for contracts is a flat contradiction of the cry of lean profits. It was reported last week, from a Sheffield source, that the colliery owners of Yorkshire, Lancashire, Derbyshire, and Notts., had now entered into an arrangement for the purpose of putting contract prices of gas coal on to a permanently higher level; and this week the "Iron "and Coal Trades Review," in a degree, confirms this. The aspirations of the South Yorkshire owners to permanently maintain a higher range of prices, have been checked by the opposing operations of the Derbyshire and Notts. owners to get the South Yorkshire business. It is, to say the least, a singular aspect of affairs that there should have been this great struggling and anxiety to secure contracts bearing, according to allegation, such emaciated profits that they were hardly worth picking up. There seems to be little question that the coal owners in these counties are now working in unison; and this is why market reporters send the intelligence that there is a much "brighter outlook" for the gas coal branch of the trade. We are quite at one with our coal contemporary in the truism that it is the effect rather than the existence of an association which counts in industrial matters; but we can see a vast difference between the effects of local associations whose mobility and action are independent, and the same associations operating under the interdiction imposed by mutual understandings. The Durham coal owners have proclaimed their spotlessness from what they obviously regard as such an unclean thing as combination or working arrangement. But the Durham coal owners know full well that what is being done elsewhere answers their purpose admirably; as Durham gas coal will always, for distant or local consumption, command prices above those set elsewhere. There would be, as Sir George Livesey said at the South Suburban Gas Company's meeting, no objection to combinations or understandings, nor even to a fair permanent increase in the level of values, if there were not these outrageous and unsettling inflations, which miners' wages, railway difficulties, the shortening of output, demand, or a reasonable additional profit in view of greater trade requirement both for home and export, are not sufficient to account for. The gas industry presents no differences in the present from the immediate past; and therefore the brighter outlook—from the eyrie of coal owners—to which the market reporters refer can only be one of their own invention.

The neatly-feigned umbrage of the coal proprietors at the protest that the gas industry has made has had no effect in stemming the flow of that protest, as will be seen by the speeches of Sir George Livesey at the meeting of the South Suburban Gas Company, Mr. Corbet Woodall at the Tottenham and Edmonton meeting, Mr. Charles Hussey at Croydon, Mr. Alexander Dickson at Bromley, and in most of the other places where gas proprietors have been assembling this last week. But the protestations from the side of the coal owners as to their altruistic attitude in the past and the unprofitable character of the gas-coal business still continue. "For a "long time past this has been," says one writer, "the most "unprofitable part of the coal owners' business." The keen anxiety to get that business effaces truth from the statement. Other strange features of the situation are the incompatible reasons given for the present extravagant views. On the one hand, there is attempted justification on the score of rising expenses, difficulties, and industrial demand, and, on the other, it is said the coal owners have discovered an abnormal wealth in the divisible profits of the gas industry of which they want a further share. The contrary reasons indicate the poverty of excuse. The one submits necessity; the other admits pure selfishness and plunder. The coal owners ought, in honour, to choose one or the other, and let us know precisely where we are. As Sir George Livesey mentioned at the South Suburban meeting, a 5 per cent. increase on miners' wages only represents an addition of 3d. per ton to the price of coal; and railway difficulties, experience shows, have been overcome. As to the shortening of output, from Yorkshire it is reported that at all the gas coal pits full time is being worked; and as to the demand, with the lighter days the pressure of delivery under contracts is being reduced. The demand for household coal is also easier. However the position for future contracts is looked at, the decision of the coal proprietors to stand firm for exorbitant prices has an insufficient support. Then as to the wealth of profit from the gas-supply industry. The compulsory issuing of capital under the auction clauses and by tender commands prices that only return to investors between 4 and 5 per cent.; so that the coal owners have in their so-called "lean" years been better off than the gas investor. In this connection, Sir George Livesey, in his South Metropolitan speech, came into collision with the "Iron and Coal Trades Review." That paper had stated that the "balance of revenue over "expenditure" of the Gaslight and Coke Company last half year was above 1s. per 1000 cubic feet of gas sold, while Sir George maintained that the "surplus" of the Company was only equal to a farthing per 1000 cubic feet. The difference arises from the point of view. When speaking of the "balance of revenue over expenditure," the "Review" did not deduct interest, and they ignored the statutory obligations of the Company before arriving at the balance of profit from the half-year's earnings available for dividend. Sir George took these matters into consideration; and evidently his reference to "surplus" was the balance of the half-year's earnings after paying a dividend of £4 8s. per cent. Another point advanced in the attempted whitewashing of the coal proprietors is "that collieries, unlike gas "companies, have no monopoly, and that they cannot secure "prices which are not regulated by the law of supply and "demand." The vacuity of the argument is brought into relief by the present experience, which shows that for special classes of coal—such as that required by gas undertakings—it is not a difficult thing for the owners to establish a *quasi*-monopoly, and obtain inflated prices. It is irritating to gas administrators, when straining every nerve to secure economies within their works to enable them to reduce gas prices so as to better meet competition (which competition is a potent factor in addition to the statutory sliding-scale in regulating gas prices), to have the advantage of these various economies filched from them in the manner of the present—more especially in view of the fact that what they have done in producing economy has wrought marvellously in bringing to a nearer level than before the demand for gas in summer and winter, which, in turn, has conferred benefit upon the coal proprietors, by putting into their hands a regularity of demand such as no other industry can offer them.

The fact that report is made that full time is being worked at certain gas coal pits, in the face of a declining rate of delivery on current contracts, suggests that there must be a cause or causes for this. In the first place, two or three of the coal market reports this week refer to the contracts

that are being made by foreign gas undertakings at advanced prices—13s. 3d. and 13s. 6d. f.o.b. being mentioned in published statements; and the prices so set are being used to force the pace for home requirements. Mr. Woodall and several other Chairmen last week added their condemnation of the removal of the duty on exported coal. When interests in which one is concerned are affected by ill-conceived action or economic fallacy, the ill-conception and the fallacy become, as in this case, more strongly defined. The new contracts for foreign delivery are one cause of the activity at the gas coal pits. Another cause is—again the reports from the markets declare it—that all the gas coals that come on to the market are now being snapped up at current prices. We can only hope that these are not panic purchases, because any such action, unless favourable prices can be obtained, will only assist, as the foreign gas coal contracts are doing, in hardening the position of the coal owners. Not at all disinterested is the advice of the "Iron "and Coal Trades Review" to the smaller gas undertakings not to hold out for lower prices, on the ground that this would be to the advantage of the large gas undertakings like the Gaslight and Coke and the South Metropolitan Gas Companies. "If the smaller buyers will take the hint," says our coal contemporary, "they will see that no one laughs "up his sleeve at their expense." The reply is that the Directors and Committees of the small gas undertakings have no more desire to have the coal proprietors laugh up their sleeves at their expense than they have that the administrators of the large undertakings should do so. They know which of the two is their best friend. Sir George Livesey and Mr. Woodall are both interested in smaller gas concerns than the two named; and if their attack on the unreasonable demands of the coal owners was only dictated by the motive attributed to them rather than by the motives engendered by a common cause, they would use the influence of the greatness of their undertakings to compass their ends by private negotiation. The winter pressure will soon be over; and there can be no possible use in rushing in while any pressure continues. An easier demand should, if the submission of justification through present conditions has any reality, produce a moderation of the coal owners' views. Contracts had better be negotiated at the customary time, so as not to play into avaricious hands by any solid contracting through undue haste or procrastination.

From the present to the future. Both Sir George Livesey and Mr. Corbet Woodall have, at meetings, suggested means for preventing injurious fluctuations of coal prices. Sir George believes, if the claims of the miners are at the bottom of the trouble, that the owners have the remedy in their own hands by putting the men in the position of becoming property owners; while Mr. Woodall believes that if "this "great necessity of the nation is to be in the hands of "individual owners, they should be subject to regulation "and control, as is the industry with which we are asso-"ciated. Prices yielding a fair return to the vendors would "be found on the average of years more advantageous than "one year of immense profit followed by many of leanness "and of comparative poverty." Here we have suggestions that may be commended to the earnest consideration of those who produce, as well as those who use, the most important factor in the material welfare of this country that Mother Earth yields.

A Presidential Address.

The address with which Mr. W. Prince, of Stoke-on-Trent, inaugurated his year of office as President of the Manchester Institution of Gas Engineers, reflects personal experience and views on many matters pertaining to gas engineering and management; and if it emphasizes one thing more than another, it is how numerous are the directions claiming from the chief technical and administrative officer of a gas undertaking mental exercise and surveillance, together with active performance. There can be no suspension of vigour in any one road. If there is, something suffers; and this may offset the gains in other directions. The President takes us from carbonizing operations to the energy necessary in pushing business; and, on all points, he exhibits himself as holding those broad views that give activity the play that is so desirable in every business enterprise that, encouraged, progresses as vigorously as does the gas industry. Mr. Prince appreciates fully how Science and time and labour saving machinery are becoming more and more important as auxiliaries in our industrial advancement. But in regard to all time and labour saving appliances, it must not be overlooked, as Mr. J. W. Helps has recently been reminding us, how much the benefit to be realized from them depends on their intelligent handling by the men. The vertical retort, it is expected and hoped, will prove another helper in forwarding the economics of gas production. While the President does not commit himself to any expression of view regarding the vertical retort system, it may, in passing, be mentioned that the Directors of the Bournemouth Gas Company, from the experiences that are now accruing at their works, speak in confident tone of the problem of continuous carbonization having now been solved. However, there is promise of valuable contributions to the general subject in the course of the present year. But turning from the new to the established practices in carbonization, too much stress cannot be laid upon the advantages of maintaining uniform conditions within retorts. The President on this point adds his testimony to the already large accumulation respecting the value to this end of the use of retort-governors, as originally advocated by Mr. Charles Carpenter. It is a rapidly growing practice; and one that has clearly come to stay, with such advantages obtaining as increased make of gas per ton and the maintenance of uniform candle power. And supplemental benefit, in avoiding trouble in these days of high heats, is found at Stoke-on-Trent (as elsewhere) by the adoption of tar-towers.

The subject of naphthalene has place in the address; and the President certifies, by data, the relief he has obtained by the simple process of introducing solvene into his Livesey washer. It would have been instructive if he had extended his observations to an explanation of the passage in the address which informs us that "at Stoke-on-Trent, we have "experienced serious difficulties for many years through "the deposition of naphthalene in the distributing system, "and *particularly so before* the introduction of either genera-"tors or regenerators into our works." This is an interesting statement, as it reverses the general experience, which has been that, with the higher heats accompanying the adoption of generators and regenerators, there has been anything but a modification of the naphthalene trouble. Perhaps the explanation of the alleviation of the anxiety and difficulty at Stoke-on-Trent is traceable to the simultaneous introduction with modern settings of one or more of the adjunctive improvements already referred to. The regret of the President that the naphthalene inquiry of the Southern Association came to an untimely end through lack of funds will be endorsed by many in the profession; but the mere cause of the untimely end induces reflections as to the prevailing apathy on the question of the financing of technical research in the gas industry. The hope expressed that the Institution of Gas Engineers may be able to take up the investigation where it was relinquished by the Southern Association is shared by us. But here, again, crops up the eternal question of ways and means; and we fear that the President's commendation of the appeal made by the Council of the Institution for subscriptions to the Special Purposes Fund, designed chiefly for the prosecution of technical research, will—it is regrettable to have to say it—bear little result. The Council of the Institution have been, as a body, the object of a fair amount of adverse criticism; and it is therefore refreshing to have the independent evidence of one who has seen the inner workings of the Council, as a district representative, as to the life and full recognition of responsibilities that exist in their midst. The assurance and the denial it gives to external stricture, clearly show the value of district representation.

In another section of the address, the vexed question of the assessment of gas undertakings is touched upon. The vagaries of rating are the subject of illustration from Stoke-on-Trent and neighbouring undertakings. But the tabular statement prepared by the President presents very distinctly the fact that latter-day local dispensation has inflicted greater burdens by monstrous rate poundages than have the rating authorities by the—admittedly extraordinary—latitude they give to their valuations. There is this difference, too, that against over-valuation there is appeal; against the exactions of those who levy the rates there is only the appeal through the *vox populi*. A comparison of the present with some years ago respecting the rates paid per 1000 cubic feet is really of little value. So tested, in the case of these Potteries undertakings, the variations in some instances are not great. Times have changed. The day consumption has given fuller occupation to plant; and this has made all the difference to comparative averages on the 1000 cubic feet basis. Given

more economical local administration, the increased output of gas brought about by day use would have caused the rates paid per 1000 cubic feet to show a marked decline, rather than the maintenance of the average, or slight increases, or small fractional recessions. If the President's suggestion that a fixed sum should be paid for rates per 1000 cubic feet of gas sold or per ton of coal carbonized were adopted as "an equitable solution of a knotty problem," it would mean the taxing of all economies in working and of all effort to realize, in actual business, as near as possible the maximum plant capacity.

A large part of the meeting was occupied by the adjourned discussions on Mr. George Stevenson's paper on "Expe- "riences in Competition for Power," and on Mr. Edward Allen's controversial communication on "High *v.* Low Grade "Gas." The debates were long and complete; both topics being much to the argumentative taste of the members. Comment and criticism on both communications appeared in these columns on Nov. 27 last; but space will not permit of reference to the discussions this week.

Municipal and Company Co-Partnership.

Between the President of the Board of Trade and the President of the Local Government Board there appears to be a difference of opinion. Mr. Lloyd-George believes that we cannot do without private enterprise; Mr. Burns believes that private enterprise stands for robbery, jobbery, and corruption, and all that is bad, and therefore the less we have of it the better. Mr. Lloyd-George, however, is more charitable, and entertains the opinion that municipalities might with advantage co-operate with private enterprise. The meaning of "co-operation" here is co-partnership without any of the risks falling on the municipalities. This plan is an addition to the doctrinal professions of the President of the Board of Trade; and its enunciation has caused a Special Representative of the "Pall Mall Gazette" to endeavour to divert into a new channel the discussion of the question of the future of electricity supply in London. The dangers and difficulties of the London County Council project are fully appreciated by our contemporary; but to its Special Representative, the idea of co-operation between companies and municipalities appeals favourably, though he does not pronouncedly commit himself to it. We hope he will refrain; for the idea is not only hedged with difficulties, but, in our opinion, to give it shape would be a positive danger to those whom a public trading concern is intended to serve. There is a better way of securing the best public service through companies than by co-operating, or having a one-sided co-partnership, with local authorities.

We will deal first with the plan. The Special Representative of our evening contemporary—following up the proposal of Mr. Lloyd-George—submits that the local authority have an asset in the right to concede to a private company the privilege of carrying on (say) an electric supply business within its area, for parting with which right they should be compensated, and the undertaking be carried on without risk of loss to the municipality. The ultimate aim of a municipality in entering into trading (though the aim is, of course, not always successful) is to make profit which can be applied in aid of the rates; and the suggestion of the President of the Board of Trade appeals to the representative of our contemporary as one in which their ambition for profit can be gratified, and yet leave the field free for cultivation by private enterprise. It is all so gloriously simple. All that has to be done is to allow a maximum dividend of 5 per cent. on the capital employed; and after the payment of all costs of generation, as well as capital, establishment, depreciation, and other proper charges, the balance profit would then be shared in agreed proportion, fixed according to circumstances between the company and the local authority—the latter having a sort of consultative control with appeal to the Board of Trade in the event of any differences arising. Here we have the outline of a plan which, it is thought, would constitute a delightfully simple way to the pacification of all trouble between municipalities and private enterprise, and assuage the longing of Socialists, Collectivists, and such gentry for profits from public-supply services.

In certain respects—not in all—the scheme reminds one of the principle of communal concessions to private enterprise which obtains on the Continent, and which does not always work out to the advantage of the consumer. But there has been nearer approach to—in fact, actual practice over a long course of years of—the "co-operative," or one-sided co-partnership, arrangement in Paris; and the result there has not been such as to commend any adoption of similar principles in this country. Take the Paris gas supply as an instance. The chief end of a public supply, or of the working of any protected system of serving the public, ought to be cheapness of commodity; but the attaining of this end was completely and effectually frustrated by the working arrangement between the Paris Municipality and the Gas Company. The Company were allowed to divide a certain amount as interest on their capital investment; and after meeting their outgoings, the Municipality and the Company shared equally the balance of profit. And, as shown in some articles which appeared in the "Journal" about a year ago, it was a handsome sharing; but it was the consumers who suffered. Every attempt that was made to obtain a reduction in price was ineffectual, for reduction to the gas consumers meant reduction of the Municipality's share of the profits. The Company were in the invidious position of having to bear the odium for the high-priced gas; while ensconced safely behind the Company were the real obstructors to reduction in the form of the Municipality. The result was that, until within the last three years of the Company's concession, the price of gas was equal to 6s. 9d. per 1000 cubic feet; while in London prices, with Companies working under the sliding-scale of dividend and price, ranged between 2s. and 3s. When the Paris Gas Company, in the closing years of their existence, did succeed in coming to an arrangement for a reduction to what was still the high price of 4s. 6d., the Municipality obtained an extra annual payment as compensation for the surrender of the additional profit that would have come to them by the retention of the extraordinarily high price. Although provision was made for periodical inquiries by Technical Commissions, they only resulted in the declaration (with the contradiction of gas making throughout the world before them) that there had not been any such improvement in the manufacture of gas as to warrant a lowering of the price to the consumers; and so, as will be seen from the figures in the last of the articles referred to, the Municipality's share of the profits from gas grew as the years progressed.

That is how what Mr. Lloyd-George calls co-operation, and what we prefer to call a one-sided and unjustifiable partnership, worked in Paris. It was a disgrace, and a standing warning of the danger of the adoption of any such plan. It was obstructive to progress, the consumers were robbed, and all the principles of fair-dealing between producer and consumer were dishonoured—What for? To fill with increasing richness the coffers of the Municipality. We want nothing of the kind in England; and Mr. Lloyd-George will do well to say nothing more about the idea. There is a better plan (about which hint has already been made) of controlling the profits of private enterprise operating under parliamentary sanction, and at the same time of benefiting the public, without taking the circuitous course of lifting the money from the pockets of consumers, passing it into the banking accounts of the Companies, thence to the Municipalities, and by them expended to obtain results inconsistent, in the smallness of utility and good, with the amount of their cost. If co-partnership there is to be in electricity supply, let it be direct co-partnership between the supplying companies and the public; whereby shareholders' dividends are varied up or down by, respectively, reductions or increases of price to the public. The sliding-scale of dividend and price has worked well and to the advantage of the public in the case of gas supply through Companies. It is a far better system than that which Paris has shown retards, and does not help forward, the public interests.

Masonic.

Last Friday, at the Midland Hotel, Manchester—in succession to W.Bro. S. R. Ogden, of Blackburn—Bro. W. Prince, of Stoke-on-Trent, was installed W.M. of the "Northern Star Lodge," No. 3053; the Installing Master being W.Bro. R. G. Shadbolt, of Grantham. Subsequently, the following were invested as Officers of the Lodge: Bro. Robert Surtees, of Fenton, S.W.; Bro. William Batt, of Manchester, J.W.; Bro. W. Severs, of Wilmslow, P.P.G. Treasurer of Cheshire, Chaplain; Bro. W. Whatmough, of Heywood, Treasurer; Bro. R. G. Shadbolt, of Grantham, Secretary; Bro. Jno. C. Pennington, of Colwyn Bay, S.D.; Bro. John Mackay, of Bradford, J.D.; Bro. J. W. Broadhead, P.P.G.S.D. West Yorks, of Elland, D.C.; Bro. George B. Smedley, of Swadlincote, I.G.; Bro. H. Barker, of Buxton, Bro. Fred J. West, of Manchester, Bro. S. Meunier, of Stockport, and Bro. J. M'Ewan, of Manchester, Stewards. Bro. T. Duxbury, P.M., P.P.G.A.D.C., is Charity Representative of the Lodge.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 564.)

The Stock Exchange last week was a prey to a degree of depression for which it is not easy to assign an adequate cause. There were some factors, indeed, which might rather have been expected to exert a contrary influence, but the adverse view prevailed. In the aggregate, business was decidedly quiet; and buyers were a scarce article. The hope that the Rand mines will receive fair treatment at the hands of their new rulers had a favourable influence; and the figures reached by the Bank reserve were comforting, though it was a disappointment to those outside that the inside authorities did not see their way to lowering the rate on Thursday. Home rails were beginning to pick up a little, when the market was distressed by the dreadful calamity in the Great Eastern Continental traffic. The week closed as it had opened, quiet and dull. The Money Market was irregular. A good demand was at first met by a good supply; but about mid-week a shortage was apparent, and the demand became sharper. This position in its turn relaxed, but firmness ruled up till the close. Discount rates were steadily stiff. In the Gas Market, there was a renewal of activity in the earlier portion of the week; but the last two days, transactions fell off considerably in point of number. Prices, where any change at all was made, were almost uniformly lower; and in one or two instances, the fall was considerable. There are, of course, people whose imaginations are easily excited by irresponsible chatter about a coal famine, and who, rushing to realize their stock, bring about the very thing they dread—a fall in price. In Gaslight and Coke issues, the ordinary was active and steady; prices sticking closely to last week's figures, with the narrow range of $95\frac{3}{4}$ to $96\frac{1}{2}$. The secured issues were little dealt in. One deal was marked in the maximum at $88\frac{1}{8}$, which brought the quotation down a point; the preference changed hands at $106\frac{1}{4}$ and 107; and the debenture, at from $84\frac{1}{2}$ to $85\frac{1}{2}$. South Metropolitan was very little dealt in, and was unchanged; the few transactions marked being at $124\frac{1}{2}$ and 125. One deal in the debenture was at $85\frac{1}{2}$. Commercials were again, for the second week running, wholly unnoticed. The Suburban and Provincial group was the most conspicuous. Bournemouth "B" marked $17\frac{1}{16}$, Brentford old was done at $262\frac{1}{2}$ and 263, and then fell 4, while the new fell 5 without business being done. The debenture marked 103 and $103\frac{1}{2}$. A parcel of Brighton original was let go at 225, and down came the quotation by 7 points. British was done at 42 free, West Ham at $105\frac{1}{2}$, and ditto preference at 124. Among the Continental Gas Companies, Imperial was quieter, and showed weaker prices—changing hands at prices from 181 to 179. Union was more active, and at lower figures, which ranged from 125 to 124, ditto preference marked $138\frac{1}{2}$. European fully-paid was quiet and firm at 25 and $25\frac{1}{4}$. Among the undertakings of the remoter world, Bombay new was done at $5\frac{1}{4}$, Buenos Ayres at $11\frac{5}{8}$ and $11\frac{15}{16}$, ditto debenture at $94\frac{3}{4}$, Cape Town at 14, ditto debentures at 52, Primitiva at $7\frac{3}{4}$, ditto preference at from $5\frac{1}{16}$ to $5\frac{3}{16}$, River Plate at $12\frac{1}{2}$ and $12\frac{11}{16}$, Monte Video at $11\frac{3}{4}$ and $11\frac{7}{8}$, and San Paulo at $13\frac{3}{8}$ and $13\frac{1}{4}$.

The closing prices are shown in our list on p. 564.

ELECTRIC LIGHTING MEMORANDA.

Progress of the Electricity Supply Industry—A Slowing-Down of the Rate of Advance in Private Business—Motive Power Connections—Getting Rid of the Electricity Burden at Bath.

The "Electrician" has issued its annual statistics relating to electricity supply in the United Kingdom; and our first words must be of appreciation of the altered form of arrangement, which makes the tables more convenient for reference. A further improvement might be effected by the omission of some of the superfluous particulars which have much the appearance of advertisement—such as the names of the meters used in different towns, and the names of the consulting engineers—and the system of generation and distribution might also be condensed. The space thus saved could be taken up by the retention of the previous year's figures relating to lamp and motor connections and the number of consumers, while changes in prices could be noted. The value of the tables would thus be vastly enhanced. The advance in business of the undertakings would be shown at a glance, without the time-absorbing references to the previous year's tables that is now demanded to ascertain what the fresh tables actually have to teach one. One striking feature that is brought out—by going back twelve months to discover it—is that the rate of progress in connections, taking the undertakings of the United Kingdom as a whole, is on the decline. The connections of both municipal and company undertakings in London and the Provinces are now equal to 1,091,315 kilowatts; last year the total was 1,030,300 kilowatts; so that the increase is 61,015 kilowatts. The average increase for the preceding three years was 142,243 kilowatts; so that the addition for the past year is 81,228 kilowatts below that average.

The first table deals with the undertakings in the United Kingdom without tramway loads. Of these undertakings, there are 275, compared with 262 last year, or an increase of thirteen. In later tables, it is ascertained that there are 125 undertakings now supplying both lighting and tramways—an increase of three in the twelve months. There are now 21 towns taking electricity in bulk—an increase of two in the year. Particulars are given of fourteen power companies, and of eleven upon which either development has been commenced or the powers are still lying dormant. Most of the power companies, however, so far as actual prosperity goes, appear to have fallen into a somewhat somnolent condition, from which all the applied energy does not seem capable of rousing them. The list of projected stations is 59. There were 72 last year; and, as the figures already quoted indicate that only a small proportion has traversed the space between projection and completion, the greater proportion of the projections of a year ago are the projections of to-day. Time is too valuable to count the Provisional Orders that have been granted but still remain undeveloped.

Looking down the statistics of the undertakings without tramway loads, the progress of the majority is painfully slow. The lamp connections, are as is usual with electricity undertakings, reduced to the 8-candle lamp basis. This low basis of calculation makes the figures in certain cases rise to quite noble representation. But if the figures were divided by eight, to see what the numbers would look like if rendered as 64-candle power incandescent gas-lamps, estimation for the figures would freely decline. We have picked out a few concerns with the topmost private connections to show their business status. The electricity supply of London is divided up among 31 undertakings; and those that take the lead in the number of 8-candle power private connections are: The Charing Cross Company (West-end and City undertakings combined), 673,000 8-candle power lamps (the number of consumers is not given). The Kensington and Knightsbridge Company have connected an equivalent of 350,247 8-candle power lamps, distributed among 3957 consumers; the Metropolitan Company, 536,700 8-candle power lamps, with 9370 consumers; and the Marylebone Borough Council, 500,000 8-candle power lamps, with 7000 consumers. Then slipping down to the other end of the scale, the Chiswick undertaking boasts only 31,000 8-candle power connections, and 1080 consumers; the Smithfields Markets Company, 30,000 8-candle power connections, and 390 consumers; and the Southwark Borough Council, 31,821 8-candle power connections, and 278 consumers. In the comments of the "Electrician" on the figures, it is pointed out that the Metropolitan Electric Supply Company no longer maintain their position at the head of the list, owing to the fact that a portion of the Company's undertaking has been transferred to the Marylebone Borough Council. The Charing Cross Company now come to the top in London, and show a "steady" increase on last year's figures. All the other undertakings exhibit a "slight" increase, with the exception of the City of London Company, the County of London Company, and the Shoreditch Borough Council, who return their outputs as being the same as in the previous year. The Southwark Borough Council undertaking presents a "slight" decrease. This looks as though in some districts in London the limits of the scope for business in electricity have been about located.

It is of interest to note how few are the towns in the Provinces that show an exceptional number of connections attenuated to the 8-candle power basis, and how great is the drop between them and undertakings whose field of supply is not complete in the favourable conditions necessary for real commercial success in the supply of electricity. Even in some of the cities and towns where a comparatively large business has been developed, we learn of accretions of business coming in with disappointing difficulty and slowness; and that this is actually so will be shown in a succeeding paragraph. However, taking out some of the undertakings showing superior success, and mentioning them in alphabetical order, there is Bristol, with connections equal to 195,688 8-candle power lamps, and 2827 consumers; Edinburgh, with 621,236 8-candle power lamps, and 9355 consumers; Glasgow, with 1,157,347 8-candle power lamps, and 13,705 consumers; Hull, with 210,101 8-candle power lamps, and 2749 consumers; Leeds, with 300,000 8-candle power lamps, and 5850 consumers; Leicester, with 189,156 8-candle power lamps, and 2774 consumers; Nottingham, with 307,023 8-candle power lamps, and 3194 consumers; Newcastle-upon-Tyne, with 269,263 8-candle power lamps, and 1150 consumers; Portsmouth, with 185,204 8-candle power lamps, and 3600 consumers; and Sheffield with 300,000 8-candle power lamps, and 3150 consumers. The towns succeeding in numerical importance break away from these large figures ("large" as electricity figures go) very considerably. Most of them show totals of consumers connected that are covered by low figures in hundreds; and there is a no mean number of undertakings that have not reached 100 consumers each, and whose connections, reduced to the 8-candle power lamp basis, show how slender is the business done. Here are examples: The connections at Chepstow are equivalent to 1800 8-candle power lamps, distributed among 37 consumers; Church Stretton, 1600 8-candle power lamps, distributed among 50 consumers; Ingleton, 1800 lamps, distributed among 85 consumers; Kildare, 1026 8-candle power lamps, distributed among 46 consumers; and Llangollen, 1000 lamps, distributed among 41 consumers. However, taking the whole of the private lighting, both of municipal and company undertakings in London and the Provinces, it represents a lamp connection of 22,886,700 8-candle power lamps, or including power and public lighting, 36,377,170 8-candle power lamps—that is to say, private lighting is equal to about 63 per cent. of the whole.

Turning back to the statistics published twelve months ago, it

is observed that even the undertakings in the larger provincial cities and towns have not in the interval done anything of a conspicuous character in booking up new consumers. Glasgow and Edinburgh were the best in this regard—the former extending their list of consumers by about 2000 and Edinburgh by 1000. But others show up poorly. Bristol, for instance, only secured in the twelve months 150 new consumers; Hull, 109; Leeds, 350; Leicester, 183; Nottingham, 401; Newcastle and District, 100; Portsmouth, 300; Sheffield, 50. From the noise that is made about the Newcastle Company and its great activity, supplemented by the "Electrical Bulletin," it might have been imagined that something more extensive was being accomplished in obtaining new customers; but it is not surprising that Sheffield shows up so badly, considering the low price of gas in the city. Low-priced gas has its checking influence. If this new custom is the best that can be shown in the large cities and towns, we need not trouble to inquire what has been done in less important ones.

In regard to the great success that is heard of, through interested channels, as to the adoption of electricity for motive power, we do not find its confirmation in the figures given in these tables; and, considering them, it is easy to understand the tortoise-like progress of the electricity power companies. The connections for power purposes are represented in total horse power. Perhaps if it were not for the evidence of these authoritative figures, it would hardly be believed that the total horse power of the motor connections of the 31 undertakings in London only amounts to 38,174. Small wonder that prudent men shake their heads deprecatingly over the proposal to spend millions of money in providing for a visionary power business in London. That the business is not greater, is not due to charges being high; on the contrary, charges for electricity for power purposes in London are as low as any in the country, and some of the undertakings boast that they are now supplying their largest industrial customers at lower figures than the County Council are suggesting in their remarkable scheme. The power connections of the Charing Cross Company are the highest in horse power in the Metropolis; being equal to 9760-horse power. The Notting Hill Company return the lowest, with 155-horse power. It might be expected that, in the great industrial cities of the Provinces, a different state of things would be found; but those who hopefully expect are doomed to disappointment. The horse-power connections of some of the principal cities and towns are as follows: Bristol, 3972-horse power; Coventry, 2346; Edinburgh, 7388; Glasgow, 11,954; Hull, 4434; Leeds, 6175; Newcastle-upon-Tyne, 6500; Nottingham, 2620; Sheffield, 6300. Then, again, for towns of less importance, the figures drop away to very minor ones, until we find that such towns as Aberystwith have connections equalling only 6-horse power; Church Stretton, 2; Colwyn Bay, 7; Fareham, 1; Holyhead, 3; Kilmalcolm, 3; Malvern, 4; Newcastle-under-Lyme, 5; Pembroke, 7; Whitchurch, 5; Woking, 7. Several towns have the word "none" occupying the horse-power column.

There have in many towns been reductions of price to private consumers both for lighting and other purposes; but, in the majority, necessity has compelled the maintenance of the old figures. Respecting the public lighting, the connections have not, except here and there, made any notable upward movement; and it is evident from the prices paid that the electricity suppliers are loth to resign much, if any, of this part of their income. Nernst lamps have been adopted, though not to any important extent, in several towns; and Tantalum lamps are being tried in a few. In two or three places, intimation is made that Osmium lamps are under experiment. But continuous current, alternating current, and voltages have their respective influences with the different lamps in limiting application.

We have devoted so much space to the examination of these returns that general topics must be passed over this week, with one exception. The exception is the important decision of the Electricity Committee of the Bath Corporation respecting the sale of the undertaking to the Somerset and District Electric Power Company. The Committee are quite willing that the city should disburden itself of the incubus that the City Council so light-heartedly took upon themselves a few years ago. We are not surprised at the resolution, when the history of the concern is considered. On the other hand, the undertaking will afford just what the Somerset Company require—a nucleus for their scheme. There are difficulties in the way of transference; but they do not appear insuperable, and in the draft agreement provision has been made for them. The city will (if the Corporation agree to the proposal, and Parliament ratifies it) get their capital expenditure returned, together with two £10,000 bonuses, or, as an alternative, £450 worth of electricity in perpetuity for each bonus. If the Corporation are wise they will take the money, on the principle that "A bird in the hand," &c. At the end of seven years, the Corporation will be allowed to discontinue public lighting by electricity if they so desire, and revert to gas. The lines of the agreement will be found in our "Miscellaneous News." Looking well at them, the Corporation will be unfaithful to the interests of the city if, now that there is the opportunity, they do not recover the capital that has proved, and will continue to prove, within the limits of their supply, so unremunerative. It has not been, nor is it now, a good investment.

Provost Arrol, of Alloa, has resigned his office, on account of ill-health. He was for many years Convener of the Gas Committee of the Corporation.

SOLIDIFYING TAR FOR TRANSPORT.

Those who know from experience the great nuisance and expense involved in the transport of tar—the cost of barrels, or special tank-waggons, as well as of conveyance—are sure to welcome any practical system (though it may only be applied with discrimination as to relative advantages to parts of outputs) of being able to render tar into a solid form for ready transmission from the source of production to the place of utilization. Mr. S. G. Coulson has solved the problem; and samples of solidified tar, produced under his invention, have been inspected. The utility of being able to readily convert tar to a solid state appeals somewhat strongly in connection with the development of its uses; as, judging from an analysis of a sample of the solidified article, no harm appears to be inflicted, by the process of solidification, upon the tar—unfitting it for these uses. Of course, this is a point that will have to be taken into fuller consideration, as well as the question of comparative cost, according to the situation of the works where the tar is produced in relation to the place where it is to be employed. Gains shown on a hypothetical case cannot be made to apply universally.

However, to work the patents of Mr. Coulson, a Company, to be known as the Tar (Patents) Solidifying and Distilling Company, has been formed; and allusion was made to this last week, when it was also mentioned that abstracts of the patent specifications of the invention were published in the "Journal" for July 26, 1904, and July 3, 1906. The invention is a very simple one; and an outline of the working for the conversion of the liquid tar to the solid state might be rendered as follows: The crude tar is pumped into a still, about which there is no particular feature. It is boiled there for about four hours. Then it is run off into a tank, wherein it is thoroughly mixed with about 4 or 5 per cent. (according to the quality of the tar) of sulphuric acid, of heavy specific gravity, for about half-an-hour or so—the tar increasing in volume by this mixing. It is then run into another tank, and there solidifies, and the solid tar is the result. It will be seen from this that the process is anything but complicated; but it involves time. The temperature to which the tar is heated is only about 150° Fahr.; and all that is removed is about 4 per cent. of water and the lightest of the oils. Everything else, it is stated, is left in the tar. At the Public Analyst's Laboratory at Sheffield, a report (signed by A. H. Allen and Partners and G. E. Scott-Smith) was made, soon after the issue of Mr. Coulson's first patent specification, upon a sample of the solidified tar; and the following are the analytical results:—

Loss at 100° C. (moisture, &c.)	2·20
Volatile matter	61·71
Fixed carbonaceous matter	35·98
Mineral matter (ash)	0·11
	100·00

As to the costs and profits arising from the distillation and solidification of tar, the following are put forward by the promoters of the Company; the figures being based upon the treatment of 10 tons of tar per day:—

To 10 tons of liquid tar at 19s.	£9	10	0
,, Labour, fuel, &c., in carrying out the process of solidification.	2	13	0
	£12	3	0

By light oils, &c., 300 gals. at 3½d.	£4	7	6
9 tons 9 cwt. patent solid tar at 25s. 6d.	12	1	0
	£16	8	6
Less cost of tar and process	12	3	0
Profit	£4	5	6

By light oils	£4	7	6
Patent solid tar at 25s. 6d. per ton	12	1	0
	£16	8	6
Less cost of process and solidification	2	13	0
	£13	15	6

Or to labour, fuel, &c., in carrying out the process of solidification.	£2	13	0
Price of tar realized per ton	£1	7	6

The profit per year to the users of the process, taking 10 tons per day for 300 working days would be £1200; and, after deducting the Company's royalty, £900.

These figures are given as they are presented by the Company; but we have no means without an actual working test of verifying them. Of course, it may be tar users will continue to prefer to pay £9 10s. for 10 tons of liquid tar than to purchase 9 tons 9 cwt. of solid tar for £12 1s. Human nature is a strange thing. Savings may be promised in barrels and conveyance; but the additional first cost of 51s. and the loss of 11 cwt. of material will weigh with some purchasers.

The question that will be uppermost in the gas-maker's mind will be of what advantage will this system be to him as a producer of tar. There are several suggested answers. In the first place, there will be saving in the cost of the tar barrels or special tank-waggons for transit; against which has to be set the casing for the solidified material. Relief will be given in the handling of the tar from the place of production right through to the place of

utilization, owing to the greater facility of dealing with a solid substance than the viscous material as now sent out. The increased facility for handling should also make a difference to the cost of transit, especially in connection with export; and the same facility, too, should broaden the fields of both purchase and application. Then there is the question of the direct recovery by the gas makers of the crude naphtha and light oils from the tar. These, it is suggested, might be further treated for the manufacture of carbolic acid or used for enriching gas. The tendency being now to lower the illuminating power of gas and not to raise it, the last-named idea, excepting perhaps in a few places, would be but short-lived. The question of the process expanding the marketability of tar is not without interest to the producer, who longingly looks for further benefit from this low-valued residual. The lighter portions of the tar having been driven off in the process of solidification, the tar in its solid form is regarded as being very suitable for road-making purposes; to liquefy it the heat now applied to the "boiling" of ordinary tar for road purposes being quite sufficient. In the making of briquettes, it is said to turn out an article of a firmer character than briquettes made as customarily with pitch as the binder. For the making of acid-proof floors, the solidified tar appears to be particularly applicable, judging from some samples of rock-like flooring that have been submitted for examination. Messrs. J. Hadfield and Sons, of Sheffield, who are experts in asphalte and similar floorings, aver that asphalte made by the aid of this solidified tar is the only real acid-proof material for floors at present on the market. This opens up the prospect of an extended use of tar for paving; and as the "Acidphalte" (as Messrs. Hadfield have appropriately named this paving) sells for 7s. 6d. a yard, or 39s. 6d. per ton on rail at Sheffield, solidified tar should realize a respectable price in this direction. The flooring-blocks by the way can be made in any size or shape. Beyond these uses, the number of which will expand with experience, the solidified tar is said to make a bright and hard-setting varnish for ironwork.

The cost of the plant necessary for the conversion of the liquid tar to the solid state is said to be about £350; or, it is understood, the Company are prepared to supply plant free, charging a royalty of (say) 2s. per ton, with, of course, a guarantee as to the minimum quantity treated.

In dealing with a process of this kind, it is impossible to write definitely, as there is so much that remains to be proved by trial. But we give this notice of the process on the information laid before us, as anything that holds out opportunity for bettering the tar market, or producing more remunerative returns from the commodity, will be appreciated by no one more than the tar producers. For them, the whole point of this or any other process resolves itself into, What is the commercial advantage?

The process is one thing, the new Company is another. The capital is £10,000, divided into 3000 £1 preference shares and 7000 £1 ordinary shares. Of the latter, 2000 ordinary shares have been allotted to the vendors; being payment on account of the rights, licences, and plant. From the statement as to contracts, it is observed that Mr. Coulson, in August last, entered into an agreement with the Water-Works, Lighting, and Power Investment Corporation, Limited—a title which does not appear now for the first time in our pages in connection with company promoting—whereby he assigned his patents to the Corporation, "in consideration of the Corporation installing the invention, and paying the expenses for the erection of a plant, and also gave the Corporation an option to purchase the patents for £2000, and also granted the Corporation a sole and exclusive licence to develop and work the patents in consideration of the Corporation paying him half of the net profit accruing from such working." The Water-Works, Lighting, and Power Investment Corporation are now the vendors; and, under the contract entered into, the Tar (Patents) Solidifying and Distilling Company, Limited, acquire (1) The benefit and rights under the agreement with Mr. Coulson, comprising, the sole and exclusive licence to commercially work the patents in Great Britain—all foreign patents excluded; (2) the vendors' interest in the licence granted to Messrs. Hadfield and Sons; (3) the plant and apparatus now being erected. The royalty reserved and payable to the inventor is 50 per cent. of the net profits made by the Company, with the option and power on the part of the Company of commuting such royalty on payment to him within two years from the date of the agreement with him —Aug. 3, 1906—of £2000, upon which the royalty ceases. The consideration payable to the Vendor Company for Nos. 1, 2, and 3, is £3000 in cash, an allotment of 2000 £1 ordinary fully-paid shares, and an agreement to perform and discharge all the vendors' obligations under the agreement of Aug. 3, 1906. The vendors undertake to pay the costs of the new plant, and their expenses to the date of the erection. The vendor Company—that is to say, the Water-Works, Lighting, and Power Investment Corporation, Limited—do not look as though they intend coming off badly in this bargaining; and after the new Company have apportioned to them the £3000 cash and the £2000 shares and paid off the inventor's £2000 (if that is to be the form of settlement), there will not be much left for the Company with which to commercially develop the tar distilling and solidifying business. The Investment Corporation do not seem to have to do much for the reward they are to receive, which is out of all proportion to that to be secured by the actual inventor of the process. Reverting to the heads of the contract, reference is made in No. 3 to the "plant and apparatus now being erected." At the beginning of the prospectus we read: "The Company have entered into a contract for seven years with a gas company to treat their make of tar; and the necessary plant and apparatus will shortly be completed for working the process and producing the patent solid tar upon a commercial scale, and from which an income will immediately accrue." We suppose this is the plant and apparatus referred to in the contract. The name of the company alluded to is kept secret; but we are wondering whether it is one of the little companies in which the Investment Corporation have been —perhaps still are—directly or indirectly interested. This is not the only respect in which the prospectus is all too vague.

INCREASE IN THE PRICE OF THORIUM.

[Communicated.]

The members of the German Thorium Syndicate, who caused a remarkable surprise about a year ago among the makers of incandescent mantles by suddenly reducing the price of nitrate of thorium from 53s. to 27s. per kilogramme, have now made a fresh move by increasing the figure to 32s. At the time of the lowering of the quotation last year, it was stated, on behalf of the Syndicate, that the object of the large concession then made was to meet the impending competition. The high price which had prevailed down to that time had caused special care to be taken in and by the owners of mantle factories to collect residuals and mantle ashes for the purpose of extracting the thorium for working up again; while at the same time certain small firms procured supplies of monazite sand from North America and Brazil for the extraction of the thorium. It was also contended that the lowering of the price was decided upon because the agreement between the German thorium producers and the suppliers of monazite sand would expire on the 1st of July next, and that the former desired to induce the latter to consent to a new arrangement of a character more favourable to the Syndicate. The only results of the diminution in price a year ago—at all events in Germany—were the extinction of some of the smaller mantle makers who had stocks of thorium on hand, and the disquieting of the market.

The present increase of 5s. per kilogramme, which was resolved upon on the 15th inst., has come at the conclusion of the winter lighting season; and it is therefore assumed that the only effects likely to be produced by it will again be the destruction of some of the smaller firms—the reason on this occasion being the non-possession of stocks. The augmentation in price, it is declared, has not had any influence on the market for thorium, as the Syndicate has for some time past taken care that the German market has been over-supplied. Indeed, it is even asserted that, until the day when the increase was decided upon, thorium produced by the Syndicate was being offered in large quantities, partly at the rate of 27s. per kilogramme, and partly at a lower figure, with the intimation that an advance was to be expected sooner or later. It appears that the Syndicate made exceedingly large contracts with mantle makers, owing to the reduction which took place last year; and delivery has to be accepted within the next four months. The tardy manner in which supplies are being requisitioned under these contracts is regarded as the principal cause of the sudden increase in price. It is hoped by this advance to be able to move purchasers all the more easily to receive actual delivery of the large quantities they have contracted for. In the circumstances, the market remains over-supplied; and the advance in price is considered, outside the Syndicate, as being merely nominal in character.

The Future of the Gas-Engine.

Last Friday night, Mr. James M'Kechnie, the Engineering-Director of Messrs. Vickers, Son, and Maxim, Limited, delivered a lecture upon the "Tendency of Developments in Engineering," to the Foremen's Mutual Benefit Society, in the Glasgow and West of Scotland Technical College. In the course of it, he discussed particularly the application of the gas-producer engine for power purposes. After describing various systems, he showed that 1-horse power could be maintained for an hour from each pound of coal; whereas the most economical steam plant required 1½ lbs., and, in many cases, as much as 5 lbs. of coal. Particular reference was made to the Oechelhaeuser gas-engines, ranging up to 2000-horse power, now being manufactured by Messrs. Beardmore. The gas-engine, he said, if universally applied, might result in a saving of £10,000,000 in the coal bill of British factories. From the waste heat in metal furnaces they might get gas to continuously run engines of 500,000-horse power. The gas-engine, because of its economy in coal, would triumph over steam for the merchant marine, and would also open a new era of usefulness for canal transport.

The Annual Meeting of the Irish Association.—The Hon. Secretary of the Association (Mr. James Whimster, of Armagh) is informing the members by circular that the Committee have unanimously decided to hold the annual meeting this year at the usual time—viz., the second Tuesday in August; and that the place will be Dublin, as resolved at the meeting last year. He invites the co-operation of the members in the preparation of a good programme.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Thirty-Seventh Annual Meeting of the Institution was held on Saturday, at the Albion Hotel, Manchester, when there was a good attendance of members. At the commencement of the proceedings, Mr. J. H. Brearley, of Longwood (the retiring President), occupied the chair.

The Hon. Secretary (Mr. H. Kendrick, of Stretford) read the minutes of the last meeting, and they were duly confirmed.

The President explained that the two proposals put forward at the last meeting, with reference to the subscription and the issue of the annual reports, had both been withdrawn. The Committee's proposal was therefore adopted.

The Hon. Secretary announced that he had had letters of regret at being unable to attend the meeting from 36 members, including Mr. Thomas Newbigging, who was suffering from the effects of an attack of influenza.

Resolution of Condolence.

The President said there was one other letter which the Hon. Secretary had received, and which was deemed to necessitate separate consideration. Mr. Watson, of Doncaster, had written saying that his brother was a passenger on the ill-fated *Berlin*, wrecked on the previous Thursday morning off the Hook of Holland, and there was every reason to fear he was drowned. It would also have been observed by the members that Alderman Frankenburg, the Mayor of Salford, had lost a son in the same disaster. The Mayor's hospitality to the members of the Institution was so recent an occurrence, that they could not do less than pass a vote of condolence with him on the loss of his son, and with Mr. Watson on the loss of his brother.

The vote was passed in silence, the members rising in their places.

Annual Report and Accounts.

The report and accounts having been taken as read, they were unanimously adopted, on the motion of Mr. S. Glover (St. Helens), seconded by Mr. W. Hill (Stalybridge).

The following are some extracts from the report:—

The Committee are pleased to present to the members their annual report, and congratulate them upon the prosperity and usefulness of the Institution. All the meetings have been exceptionally well attended throughout the year. The Commercial Sections continue to be well supported, and have been the means of disseminating much useful information among the members. Visits have been paid during the twelve months to Huddersfield, Longwood, Ilkley, and Salford; and appreciation of the manner in which the members have been received and entertained has been duly recorded. The gas-works at all four places were inspected on the invitation of the respective gas authorities. All the officers, committee, and candidates for membership included in the ballot-sheet were elected at the November meeting; the President for the ensuing year being Mr. W. Prince, of Stoke. At the November meeting, 1906, the members decided, after a long discussion, to abandon the old form of quarterly reports, and to issue to the members, on the payment of 2s. 6d. in addition to their ordinary subscription, the volume of "Transactions of District Institutions." The "Question Box" instituted in 1905 has been abandoned owing to lack of support.

During the year arrangements have been finally made for the holding of a Gas Exhibition on unique lines in St. James's Hall, Manchester, from Oct. 23 to Nov. 9, 1907. A strong Advisory Committee has been appointed; and the Council of the Society of British Gas Industries have passed a resolution according it their hearty support, and will appoint some of their number to act with the Advisory Committee on all questions affecting the exhibition. A report was presented to the members at the November meeting which fully explained the position; and it only remains now for all to advertise the exhibition to their consumers to ensure a complete success.

The membership roll shows a slight increase, and now numbers 150. Two members have resigned, and two have ceased membership under Rule XIV., while on the other hand six new members have been added to the roll.

A new departure was made at the November meeting in 1905, when the rules of the Institution were altered to admit of the election of associate members; but so far only two have been elected.

Your Committee record with pleasure the maintained vitality of the Institution; and the increasing interest manifested in the quarterly meetings is a good augury for the future.

On behalf of the Committee,
(Signed) Jno. Hy. Brearley, President.
Feb. 1, 1907. H. Kendrick, Secretary.

The President said that the accounts were not audited at the time they were sent out; but this had since been done.

Mr. Elliott said he and his colleague Mr. Lamb had gone through the books, which were kept in excellent order, and had found everything correct.

Reports of Commercial Sections.

The reports of the Commercial Sections having been taken as read,

The President pointed out to all the members who had not yet joined these sections, the great value they were to the industry, as would be seen at once on perusing the reports. He should much like to see the membership of both sections largely increased.

Manchester Gas Exhibition.

The Hon. Secretary said it was stated in the report that the Council of the Society of British Gas Industries had passed a resolution according the exhibition their hearty support, and had stated their intention of appointing some of their members to act with the Advisory Committee. When this had been done, the Committee would be able to send out circulars to all likely exhibitors. He learnt from the Manager of St. James's Hall that already he had had some twelve to fourteen applications for space.

The Use of Tar in Road Making.

The President announced that a letter had been received from the Roads Improvement Association, who desired to bring prominently before all who were interested in the use of tar for roads a competition which the Association had on the subject. The matter was of such great importance to their industry that he thought he had only to mention it to ensure that each member would do his best to further the trials which were being carried out on the use of tar in the making and covering of roads.

Nomination of the District Member of Council of the Institution of Gas Engineers for 1907-8.

The President announced that the present District Representative, Mr. W. Prince, would retire from office in June.

Mr. T. Duxbury (Oldham) moved that Mr. J. Wilkinson, of Halifax, be nominated as District Representative. Mr. Wilkinson was nominated last year; but, owing to some mistake, his name was not in the hands of the Committee in time. Mr. Wilkinson was well known to the members as a former Secretary of the Institution, and they might be quite sure he would be a good representative.

Mr. S. Glover asked if any steps had been taken to ascertain whether Mr. Wilkinson would be willing to serve if nominated.

The Hon. Secretary said Mr. Wilkinson was quite willing to serve last year, and had the consent of his Council to do so.

Mr. J. C. Belton (Chester) seconded the motion, which was carried unanimously.

Induction of the President-Elect.

The President said his next duty was one in which pleasure was mingled with regret, and that was to hand over the reins of office as President of the Institution to his successor, Mr. Prince. Twelve months ago he asked the members to accord him their support, and had said that with it he had no fear as to the success of his year of office. This support had been given to him; and he thought he might say that the year had been a successful one. The attendances at the meetings had been excellent, and the membership roll had slightly increased. His best wish to his successor was that the same help and sympathy might be accorded to him as he (Mr. Brearley) had enjoyed. He could not give up office without testifying to the painstaking manner in which the secretarial duties had been carried out by Mr. Kendrick. He felt that his term of office would not have been nearly so successful if it had not been for that gentleman's assiduous attention to his duties; and he rejoiced to know that he was continuing in office for another year, because the new President would at least be assured of the assistance of a good Secretary.

Mr. W. Prince (Stoke-upon-Trent) then took the chair, and met with a very hearty reception from the members.

The President said the first duty that devolved upon him was to ask the members to pass a very hearty vote of thanks to their late President. He could quite believe Mr. Brearley when he said he parted with his office with regret, because he had had a very pleasant year. He had inaugurated two special movements—one with regard to the annual reports and the reports of the district meetings; and, secondly, the Manchester Gas Exhibition, which he trusted would be a great success. A very active Committee were at work seeing to all the details; and he looked forward to the exhibition being something more than they had been treated to in the past in the shape of gas exhibitions, and that the whole district would be permitted to see the very best that the industry could produce for the lighting and heating of its dwellings. They had also to thank Mr. Brearley for their introduction to the works of the Salford Corporation.

The resolution was carried unanimously.

Mr. Brearley thanked the members for their kind vote. He said the only thing he wished to refer to was the exhibition. He had been delighted to see the enthusiasm and vigour that their esteemed and venerable friend Mr. Thomas Newbigging had displayed in the matter. This gentleman had, with reluctance, taken up the duties of President of the Exhibition Committee; and he was going about the work in no half-hearted manner. He (Mr. Brearley) was quite sure that in such hands it would be very great success.

The President then proceeded to deliver his

INAUGURAL ADDRESS.

Gentlemen,—It is customary for your President to preface his presidential address by thanking the members of our Institution for the high honour they have conferred upon him. Permit me then to express my deep appreciation of this mark of your favour

to myself, and to the district that I am privileged to represent. While not unmindful of all my obligations to my fellow-members of the Manchester Institution, and the responsibilities of your President, I must candidly confess that I enter upon my duties with every confidence that the year's working will be satisfactory, if the support I obtain is proportionate to the numerical strength of our Institution and the eminence of the gentlemen who form your Committee.

At the outset of my address, permit me to express my belief that at no period in the history of gas manufacture has Science played so important a part as it is doing to-day, in the devising and application of time and labour saving machinery—now so very necessary in each process—from the deposition of coal upon the works to its removal in the form of coke and other bye-products for the market. Moreover, the same opinion holds good when we consider the far-reaching results of the labours of those engaged in laboratory practice—all alike animated by the one desire for greater purity, usefulness, and the cheapening of our commodity.

I notice from reports issued by the Home Office that the output of coal in the United Kingdom for 1905 was 236,128,936 tons; that 14,295,602 tons, or over 6 per cent., of the total output was gas coals; that 149,791,676,000 cubic feet of gas were made; and that the capital employed was £121,241,335. These figures clearly indicate the extent of our business.

CARBONIZING COAL.

It would serve no useful purpose to enumerate at any length the various methods employed in converting this great mass of coal to a gaseous state. But, in passing, special attention ought to be called to the most recent form of retorting. In dealing with this matter one may refer to the excellent paper, "On the Working of the Vertical Retort," read by Herr Körting, and to the experiences of Mr. Brockway as described by him in his Presidential Address at the Eastern Counties Association annual meeting. Both these addresses—based upon actual experience—must be of great value to any who may be considering the expediency of adopting some such form of extension. I am in a position to state that other valuable contributions on this subject will be presented to you during the course of the year.

RETORT-HOUSE GOVERNORS.

In connection with carbonizing, I wish to make allusion to two valuable adjuncts to retort-settings—the "Retort-house Governor" and the "Tar-Tower." The retort-house governor recently designed by Mr. Charles Carpenter, of London, and introduced into many works, is of simple construction, and I find it of the greatest utility. I have one fixed on the foul main at the end of a bench of five arches, each containing eight through retorts 22 inches by 16 inches, oval ⌂ section. This governor prevents over-exhausting, and at the same time so governs the pull of the exhauster that a constant vacuum (as predetermined by the load on the top of the governor bell) is maintained in the hydraulic main. By this arrangement, I am enabled to work with a minimum of seal, and at the same time the pulsations of the exhauster are regulated by the governor. The result is perfect distilling conditions in the retorts, with consequent increase in the make of gas per ton of coal carbonized, and maintenance of uniform candle power.

I can strongly advise those who have not already adopted this governor to give the matter very close attention. The control of the vacuum in the hydraulic main was, up to quite recently, effected from the exhauster, between which and the benches great variations of vacuum can arise. Control should be at the point where it has the greatest effect on the quantity and quality of the gas—viz., close to the retorts; and this can only be obtained by a governor on the foul main close to the hydraulic main.

At Stoke-upon-Trent, the vacuum at the exhauster inlet is 1½ inches; and this is reduced by the governor to 2-10ths inch on the retort side. This pull can, however, be varied at will by simply altering the governor load.

TAR-TOWERS.

It has been stated by some authorities that we work in cycles, and that in a more general adoption of the tar-tower we are simply improving on the idea presented in an admirable paper on the "Evolution of the Hydraulic Main," by the late William Carr. This paper was read at the meeting of the Institution in London in the year 1899; the distinctive feature being the removal of the tar as it was deposited in the hydraulic main. Too much cannot be said in commendation of the adoption of such an adjunct to any setting of retorts working with high heats. By the adoption of the retort-house governor in conjunction with the tar-tower, the deposition of carbon on the retorts and stopped ascension pipes will be avoided, naphthalene troubles will be reduced, and the danger arising from a pitching-up of the plant will be got rid of. I once had my plant almost entirely stopped by the pitching-up of the hydraulic main and tar-pipes. The recollection (by no means a happy one) excites my greatest sympathy for those brother managers who have similar difficulties.

NAPHTHALENE.

Now that I have introduced the subject of naphthalene into my address, I will devote a few brief passages to this almost worst of plagues. It is a regrettable fact that the Naphthalene Committee promoted by the Southern District Association of Gas Engineers has presented a final report in which they intimate that, in consequence of lack of funds, they are unable to proceed further with their investigations. Notwithstanding this, the labours of the Committee will materially assist in the elucidation of the subject. I have from time to time read their reports with much pleasure, appreciated their endeavours, and could have wished them a larger measure of success. It is to be hoped that the good work of the Committee will be recognized by the Institution, and such steps taken as may be deemed necessary for the more effectual prosecution of the work so ably begun.

At Stoke-upon-Trent, we have experienced serious difficulties for many years through the deposition of naphthalene in the distributing system, and particularly so before the introduction of either generators or regenerators into our works. That the trouble is the outcome of varying temperature, most of us are agreed; and accepting as I do this theory, I have been content to apply the readiest means for its removal immediately the trouble makes its appearance.

I am perfectly satisfied that any system introduced into our plant, in the nature of wire-drawing the gases, must very materially assist in the elimination of naphthalene. We have, however, no such system on our works; but we have adopted the principle of washing the gas as follows: A quantity of solvene to give a seal of 3 inches upon the ammoniacal liquor in the Livesey washer, is introduced. This has the effect of creating a large amount of spray or foam—thus considerably increasing the washing surface originally available; and at this stage unquestionably a disassociation of the free naphthalene from the gas commences. The cost of the same, based upon an extended period of working, is 0·07d. per 1000 cubic feet.

Subjoined is a table showing recent tests of our gas for naphthalene:—

Date, 1907.	Gas Tested and Place.	Grains per 100 Cubic Feet.	Weather Remarks.
Jan. 21 . . .	Purified gas in laboratory.	3·60	Mild.
,, 23 and 24 .	Crude gas at inlet of washer.	2·42	Freezing hard.
,, 24 and 25 .	Purified gas in laboratory.	1·43	,, ,,
,, 25 and 26 .	,, ,, ,,	1·62	,, ,, (less severe).

During these tests the temperature at the outlet of the condensers registered 40° to 43° Fahr.

PUSHING BUSINESS.

A very great deal has been stated and written on this branch of our business, and no doubt rightly so. We have entered the race with the firm conviction that gas, which has been the foremost lighting agent for many years, must not only remain so, but that it is with this addition a factor to be taken into account by those adopting power appliances. Great strides have undoubtedly been made in the supply of gas to the manufacturer for power purposes as well as to the artisan class in the form of an economical friend. As we scan the statistics so often arrayed before us, we recognize the keen competition to which we are subjected, and are impressed with the desirability of cheapening our product—particularly for power, heating, and cooking purposes. In dealing with this matter (one, to my mind, of great importance), I feel that such lines as those laid down by our esteemed friend Mr. Thomas Newbigging, in his paper "On the Price of Coal Gas" (read before this Institution in November, 1905), should, or ought to, obtain.

In Stoke-upon-Trent, our staple industry is the manufacture of china, earthenware, &c. Hence I am not exercised very much with the competition of suction-gas plants—in fact, the demand for gas-engines is very limited indeed. The total number employed at the present time is only 17, which have an annual consumption of slightly under 6 millions. These figures will be astonishing to many when they think of the veritable hive of industry in which our works are situated. But I must ask my hearers to remember that, in the methods of the trade, conservatism is a dominating characteristic. I am happy, however, to think that there appears to be a disposition to give serious consideration to the adoption of gas-firing for kilns, &c.; and important trials are now being made. The effect of this venture, if pursued to success, will have important results. It will reduce our smoke nuisance to a minimum; our atmosphere will be purer; and it will doubtless give an impetus to our business. I have prepared a table showing our growth in quinquennial periods, and from it can be traced the introduction or popularization of the gas-cooker and the prepayment gas-meter. The former are let out on a rental of 10 per cent. on cost, *plus* 20s. to cover the cost of fitting materials and fixing. The whole of the rents accruing are applied in the reduction of the "Stoves Capital Account," which I believe to be a sound financial policy. Gas-fires and other appliances of a similar character are sold at net cost; the fittings and fixing of same are free of charge. With the prepayment meter, we supply neither cooker, griller, nor fitting of any kind; neither do my Committee contemplate any alteration to this rule. One cannot pass from this subject without uttering a note of thankfulness that such a means was conceived of placing gas into the most humble home.

PUBLIC LIGHTING.

Another satisfactory feature in our business is the regaining of the lighting of our public streets, particularly in our large cities. Liverpool was, I believe, the pioneer city to awaken to the excessive cost entailed by the electric lighting of public thoroughfares

Year.	Coal Carbonized.	Gas Made.	Make per Ton of Coal Carbonized.	Gas Sold.				No. of Consumers.		No. of Stoves on Hire.	No. of Public Lamps.		Population.
				Private Lighting.	Motive Power.	Public Lighting.	Total.	Ordinary.	Automatic.		Ordinary.	Incandescents.	
				Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.						
1895	9,567	95,924,000	10,026	75,481,800	..	14,268,800	89,750,600	2500	158	151	592	..	25,900
1901	13,555	128,887,000	9,508	100,019,800	3,561,600	15,874,600	119,456,000	2458	1640	671	631	50	30,158
1906	13,183	139,702,000	10,673	103,076,200	5,329,300	17,503,200	125,908,700	2206	3163	1334	293	467	33,500

and was speedily followed by others—notably London—with the result that the electric standard has been steadily displaced. This has resulted in a more extended application of high-pressure and other forms of incandescent gas lighting; the consequent saving in cost has been enormous; and a greatly improved light is obtained. The adoption of a tried appliance for the lighting and extinguishing of street-lamps from a central or manufacturing station, is an immense boon. Light can be applied instantly at any hour throughout the area of supply, and great economy is effected by shortening the burning hours and a lengthening of the life of the chimneys and mantles—both of which are important factors meriting consideration.

GAS EXHIBITION.

It must prove a source of gratification to members of our Institution that the projected Gas Exhibition to be held during the coming autumn has met with such a hearty and liberal response from manufacturers and exhibitors. Our mission undoubtedly is to educate our consumers as to the most ready, efficient, and economical means of lighting, heating, ventilating, and labour-saving applications of gas. To this end, our Institution has very wisely decided to hold an attractive and instructive exhibition, in a centre of so many and varied industries as Manchester and its environments present. We feel assured that our efforts will be appreciated and acceptable to those we are hoping to cater for; and even though the project entails a great amount of work and anxiety, it is a duty we owe to our district, and as such it will be carried out with the sincere and pure motive of establishing our profession in its proper position.

INSTITUTION WORK.

In dealing with the work of the Council of the Institution of Gas Engineers, I can assure those gentlemen of this District Institution whom I have the honour to represent on the Council, that that body is fully alive to its responsibilities. Good results are being achieved by the various Committees, by actively pursuing policies calculated to further extend the value, usefulness, and importance of our profession. I trust the appeal for funds recently made upon all owners of gas undertakings may bear such fruit as will enable the work of investigation and research to be prosecuted more thoroughly in the future than was possible before the inauguration of this special fund. While much has been done by our Parliamentary Committee in respect of measures already existing, there is something more to be done in the nature of a frontal attack upon those departments which are responsible for the appointment of Committees whose duties are the consideration of the Gas-Works Clauses Acts (now in many instances obsolete), governing illuminating power, sulphur restrictions, &c.

ILLUMINATING POWER.

With respect to the burners for testing illuminating power, there has been an important change during the past twelve months—namely, the standardization of the "Metropolitan Argand Burner, No. 2"—a burner which has met with almost universal appreciation, because it possesses the reputation of being just and honest to consumer and producer alike. Its value can only be rightly estimated when we consider that it is applicable to so wide a range in quality as between 12 and 20 candle gas. There can be little doubt that by its more general adoption comparisons of costs will be in a large measure simplified.

SULPHUR.

It is a matter for congratulation that the long-existing obligation to keep down sulphur compounds within unreasonable limits has been removed as regards a large number of gas undertakings—the Royal Assent to such removal having been given on the 20th of July, 1906. Another Bill will be submitted to the House this year to free other undertakings. For this good office, together with much of the pioneer work connected with the elimination of iniquitous limitations, we have to thank those responsible for the administration of the Gas Companies' Protection Association.

THERMAL EFFICIENCY.

To-day one of the vital essentials in the manufacture of coal and other gases is thermal efficiency; and I am pleased to note that the Metropolitan Gas Referees are exerting themselves in the direction of introducing the best-known apparatus for the estimation of calorific values; and new conditions under which tests have to be made are in operation. When we consider the relative values of gases from this standpoint, what a wide margin there is between (say) coal gas of 650 B.Th.U. per foot and Mond gas at 120 B.Th.U. per foot.

STANDARDIZATION.

Adverting to the report of our representatives on the Engineering Standards Committee, dealing with the question of the standardization of flanges, gas-pipes, valves, &c., it appears to me that this Institution might with advantage consider the advisability of a more general standardization of gas plant. I have the conviction that the consideration of such an important matter would be likely to confer a boon upon many of our professional brethren, inasmuch as in the work of bringing plant up to present-day requirements, it would be patent to directors and committeemen alike that the proposals of the engineer were justifiable.

VENTILATION.

No doubt many of us are eagerly looking forward to the lecture to be given by Professor Vivian B. Lewes, in Dublin during the annual meeting of the Institution of Gas Engineers, on the effects of gas lighting so far as it concerns the vitiation or otherwise of the atmosphere of our houses. Much valuable information will undoubtedly be forthcoming for our guidance. I am certainly imbued with the belief that gas can and will play an important part in ventilating schemes of the future.

ASSESSMENT.

The further protection of the industry against the ever-growing rapacity of the tax assessors (who appear always to imagine us fit subjects for their plunder), has been advocated for many years. I regret, however, that no definite plan of action has been agreed upon. The subject is beset with many difficulties, but in most cases purely local in their bearing. These, however, have made the subject a vexatious one, and (as it would appear) one in which the legal fraternity cannot well be dispensed with. Subjoined is a table giving some analyses from Stoke-upon-Trent and other towns in our immediate neighbourhood (classified for purposes of privacy under letters) introduced with the object of showing how unequal the tax is applied for want of a governing principle.

When we examine the rates given in "Field's Analysis" of the 35 principal gas undertakings, we find a much greater variation existing. These 35 undertakings pay an average of 2·06d. per 1000 cubic feet of gas sold. The maximum rate is equivalent to 4·33d. per 1000 cubic feet sold; while the minimum rate equals 0·6d. These statistics prove the necessity for concerted action to secure an uniform rate of taxation, and ending those annual and quinquennial disputes.

I am of the opinion (based upon experience with different bodies of assessors) that a fixed sum per 1000 cubic feet of gas sold, or per ton of coal carbonized, would be the most equitable solution of a very knotty problem.

This subject has for many years engaged the attention of

	Gas Sold.			Rateable Value of Works, &c.			Rateable Value per 1000 Cubic Feet of Gas Sold.			Rates in the Pound.			Amount of Rates (excluding Income-Tax).			Rates Paid per 1000 Cubic Feet of Gas Sold.			Selling Price per 1000 Cubic Feet.	Percentage on the Selling Price.
	1896.	1901.	1906.	1896.	1901.	1906.	1896	1901.	1906.	1896.	1901.	1906.	1896.	1901.	1906.	1896.	1901.	1906.	1906.	1906.
	Cubic Feet.	Cubic Feet.	Cubic Feet.	£	£	£	d.	d.	d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	d.	d.	d.	s. d.	d.
A	91,029	119,456	125,908	104 1,561	104 2,090	250 2,702	4·39	4·41	5·63	0 8 7 2	1 10 7 1	3 0 8 7	3 9 4 559 7 2	9 10 8 740 4 2	37 10 0 1,159 12 2	1·48	1·51	2·28	3 0	6·33
B	50,290	73,364	80,300	1,000	1,459	1,841	4·77	4·77	5·50	6 10	7 2	7 4	341 13 4	522 16 2	675 0 8	1·63	1·71	2·02	3 3	5·20
C	95,000	140,000	134,000	2,087	2,150	2,711	5·27	3·69	4·86	7 8	8 10	9 0	800 0 4	949 11 8	1,219 19 0	2·02	1·63	2·19	2 11	6·26
D	79,724	101,096	107,000	1,570	1,570	1,570	4·72	3·72	3·52	5 8	6 6	7 9	444 16 8	510 5 0	608 7 6	1·34	1·21	1·36	3 0	3·78
E	125,758	184,799	204,217	3,480	3,480	3,480	6·64	4·52	4·09	6 6	7 1	8 10	1,131 0 0	1,232 10 0	1,537 0 0	2·16	1·60	1·80	2 6	6·00
F	262,732	338,899	352,649	4,959	4,214	4,672	4·53	2·98	3·18	7 9	8 0	9 7	1,921 11 1	1,685 16 0	2,338 18 1	1·75	1·19	1·59	2 6	5·30
G	130,102	152,470	185,417	2,532	2,754	2,786	4·67	4·33	3·61	6 6	7 1	8 5	822 16 5	975 5 9	1,172 4 7	1·52	1·53	1·52	2 4	5·43
	834,635	1,110,084	1,189,491	17,293	17,821	20,012	4·97	3·85	4·04	..	..	..	6,024 14 4	6,625 19 5	8,748 12 0	1·73	1·43	1·76	..	..

various writers and members of our profession; but that fact should not deter our Institution or the Gas Companies' Protection Association from taking such measures as would ultimately bring about effective legislation with regard thereto.

REPAYMENT OF LOANS.

Other subjects that might profitably receive the attention of our Parent Institution are the advisability or otherwise of approaching the Local Government Board with a view to securing for the future greater uniformity in the length of time allowable for the repayment of our loans. It is interesting to note in the Blue-book for 1905 relating to this department, that no less a sum than £6,250,000 was authorized to be spent on so-called public improvements during the year under review. The particular point which concerns our industry lies in the fact that this body varies its times for repayment of loans so considerably as between 8 and 60 years.

Another important item is the removal of the restriction to borrow money for the purpose of erecting water-gas plants. Surely this mode of gas manufacture has become sufficiently understood to warrant its inclusion among the various types of plant for which a lengthy period of repayment is allowed.

COMMERCIAL SECTION.

I am presuming that my hearers will consider no address from this chair complete without some allusion to our Commercial Section, and the good work achieved by this branch of ourselves. That much success has crowned the pioneer efforts of friend Meunier was evidenced in a tangible manner (so far as our own members were concerned) at the meeting held in Huddersfield in May last year. But the most gratifying feature lies in the fact that most other kindred Associations see the wise policy of such a section and are emulating our example. There can be no doubt that considerable financial advantage must accrue to the employers of members from the policy advocated—that is, to secure the best possible prices for the whole of our bye-products. This, of itself, is enough to justify its existence. Moreover, the fact is that working costs are regularly compared and discussed at our meetings, and difficulties as they arise to individual members (sufficiently interesting for the Institution to take cognizance of) are all duly considered.

In conclusion, Gentlemen, let me say that only a few of the salient features connected with our important business have been touched upon in this address. The time at my disposal prohibits a longer or wider range of subjects being dealt with. I cannot but believe that the progress and development of the gas industry is very largely due to the healthy stimulus it has received from its competitor and rival the electric light, for were there no grit in the grindstone the axe would be a long time in grinding, and only when our profession was threatened did we rise to the occasion and prove that gas, as an illuminant, occupied the foremost place. But we must not—nay, we dare not—remain stationary. The philosophy of to-day is the common-sense of to-morrow; and only by a consistent and persistent application on our part to the work of research can we hope to continue in the proud position which we occupy to-day.

Mr. W. W. Hutchinson (Barnsley) proposed a hearty vote of thanks to the President for his admirable address, which was full of information, and reflected great credit on him.

Mr. J. G. Newbigging (Manchester), in seconding, said the address dealt with a number of matters which were of great interest to the members, and was a very excellent one throughout. They had been favoured during recent years with up-to-date and very excellent addresses from their Presidents; and Mr. Prince had that day maintained the standard. He had taken office in an important year—namely, the year of the exhibition in Manchester, which they hoped to make a great success, and thereby further their interests.

Mr. S. Glover (St. Helens) supported the resolution; remarking that the address made them wonder why they had been so short of subjects to discuss at their meetings. The President had brought forward a contribution bristling with questions, many of them having two sides.

Mr. J. H. Brearley (Longwood) said it gave him great pleasure to put the resolution. He had listened to the address with delight; and he was quite sure that all that had been said with regard to it was fully justified. Perhaps they might tempt Mr. Glover out of his seclusion at St. Helens, to deal with some of the points he had referred to, and not leave them in a semi-anticipatory state. They were all very anxious to know what the other side of a question was; and he did not think they should be content until Mr. Glover came forward and tackled some of them.

The resolution was carried unanimously.

The President thanked the members, and said he was sure there ought to be no dearth of papers, though he must admit that his address had troubled him in the making. But he felt, like many others had felt in the past, that he had not been able to do justice to himself. It had been a labour of love on his part to do what he had done.

The Hon. Secretary said Mr. Glover had pointed a moral and Mr. Brearley had followed it up. He should like to announce that he had still room for just one paper in May, and another for the November meeting.

EXPERIENCES IN COMPETITION FOR POWER.

The adjourned discussion on Mr. G. E. Stevenson's paper on the above subject, read at the previous meeting, was then proceeded with.

Mr. G. E. Stevenson (Long Eaton) said he was afraid the time which had elapsed since his paper was read might have somewhat cooled the desire to discuss it. He was very uncertain whether he should be able to attend this meeting; and, as a matter of fact, he had not looked at the paper since last November. With the exception of various letters which he had received from different parts of the country, and some slight attention that he had paid to papers devoted to suction-gas plant, &c., it had almost escaped his notice. He might remind the members that he did not pose as any authority on power. He was led into giving the paper simply because he was very much indebted to their Commercial Section. The chief points in the paper were with regard to the competition of suction gas, and whether what was claimed for it by the makers was true and obtained in actual practice, or whether the statements should be modified. He happened to have had about three years' experience with those people; and he had given his views. He thought in winding up the previous discussion he said that the main point was, Was suction gas a serious competitor? If so, could it be met, and what was the best way to meet it? Of course, in this there were many side issues involved. With some members, the power business was not worth attention; and the whole question of differential prices and the quality of gas must necessarily come into consideration. These, he thought, were the main points of his paper.

Mr. T. Duxbury (Oldham) said that they were much indebted to Mr. Stevenson for bringing forward the question of suction gas. Whenever they had a competitor, he thought it was their duty to try and meet it fairly and squarely. They had had many competitors in the past; but they had all gone to the wall, and it was his candid belief that this would be the fate of suction gas. He was afraid that its competitive powers were being too greatly magnified, and that they were looking too much on the serious side of the question. He, for one, did not believe half that the makers of suction-gas plant wanted them to believe. It was well known that many producer gases of various kinds had come forward—for instance, Mond gas, Dowson gas, and acetylene gas, to say nothing of electricity. These had all come to revolutionize the coal gas industry; but this state of things had not arrived yet. The fate that had been experienced by all their other competitors would be shared by suction gas. At the same time, they ought to do all they could to bring their gas down to such a price that it would hold its own with suction gas, though he did not think for one moment that such a price as 1s. or 1s. 6d. per 1000 cubic feet should be considered. If they produced a good coal gas at 2s. per 1000 cubic feet, there would be little fear of their being knocked out of the market by suction-gas plant. The makers of such plant took care to omit several items of expenditure which ought not to be excluded. Though he said 2s. was a reasonable figure, if they could follow people who could afford to supply gas at a lower figure, it was their duty to do so. He entirely agreed with their old friend Mr. Thomas Newbigging, when he said in his paper at Stockport fifteen months ago, that they ought not to rob their lighting consumers for the sake of giving their gas away to power users. They had decided not to do this in his town. In Oldham, they had 350 gas-engines; and their price for gas all round was 1s. 9d. to 2s. 2d. per 1000 cubic feet. They had no differential charge for power purposes. Out of these 350 gas-engines, which consumed only 60 million cubic feet per annum, 300 were below 20-horse power. There were 85 consumers of less than 7000 cubic feet a quarter with gas-engines, 50 who used less than 13,000 feet, 50 who used less than 25,000 feet, and another 50 who used less than 50,000 feet per quarter. There had been an attempt to frighten them into supplying gas at 1s. or 1s. 6d. per 1000 cubic feet by shaking suction gas in front of them. But they had not done so; and although there were some suction-gas plants going into their district, they had decided that, if they had to bring their gas down to 1s., they could not compete with them. He did not believe in giving his gas away to the power consumer, and making the lighting consumer pay for it. He had one consumer who this year would probably take 100 million cubic feet; and the firm had their gas at 1s. 9d. He took it that it would be most unfair if they were to supply the 350 power-gas users at a lower figure than this one consumer, who used 50 per cent. more gas than they did. On this ground, he thought they ought not to be frightened into reducing their price down to the ridiculous figure of 1s. or 1s. 6d. per 1000 cubic feet, when their ordinary price was about 2s. Gas-engine users naturally would do their utmost to prevail upon them to supply gas for the purpose at a low figure; and when once they had brought their gas down to 1s. 6d. per 1000 feet, there was no chance, even if the suction gas failed, of putting the price up again to what it was originally. He was confident that, if they did their utmost to bring down the general price of gas, and compete with suction gas as well as they could, and not get into a panic about it, they would eventually win and hold the market. Personally, he did not believe in differential rates of any kind—or, at any rate, differentiation between lighting gas and power gas. If they gave a differential rate at all, it ought to be to the larger consumer of gas, because it involved less collection, and

there was less expense connected with it in every way. At the last meeting, their ex-President, Mr. Meunier, spoke very strongly, and Mr. Stevenson supported him, as to these differential rates; and they all knew that Mr. Meunier had a strong opinion with regard to supplying gas very cheaply for certain purposes. Having had charge of an electric light station, he believed Mr. Meunier was stricken with the rate fever of the electricians, and that he had the electricians on his mind. They had nothing to learn from the electricians; on the contrary, the latter had something to learn from their methods of charging. He believed with Mr. Newbigging that, if they had anything to give away, they ought certainly to consider the lighting consumer, who had been, and was yet, practically the backbone of the gas business. Mr. Stevenson had given many useful suggestions in his paper; and they were extremely indebted to him for them, because they would assist them in arguing the point with would-be suction-gas users when they came to discuss the matter. Mr. Stevenson had mentioned the question of the emergency supply. It seemed to him unfair they should have to put on an emergency supply for every fickle competitor who came forward. They had no reliance upon themselves, and therefore they had to place a meter there as a stand-by for any failure. He agreed with what Mr. Whatmough said at the last meeting—that this was a subject for the Institution of Gas Engineers to take up. It was not fair that they should have to lay on a stand-by, and leave their capital there, for no consumption, simply because they were compelled to do so by Act of Parliament. He wished to thank Mr. Stevenson for his splendid paper; but, at the same time, he should have liked it better if he had not treated the matter in so serious a way as to lead them to believe that they ought to bring down the price of gas to 1s. per 1000 cubic feet to compete with suction gas. It was all very well for gas-engine makers to argue the point, and try to show that they ought to let them have gas at 1s., because it was a matter of business with them; but personally he really believed that, if they persevered with their gas manufacture as they had done during the last ten or fifteen years, eventually suction gas would not be the great competitor it was at present imagined to be.

Mr. S. Meunier (Stockport) said he did not know whether Mr. Duxbury was trying to "bell the cat" or to get him on his legs, but he had certainly succeeded in doing this, whether or not he wished it. He had certainly pretty freely stated at the last meeting his opinions with regard to suction gas and the way to meet it; and they all knew what his ideas were with regard to the prices to be charged for gas, whether used for lighting or for heating. His views on this subject would be gathered from his presidential address, which he took a great deal of pains to compile. He wished to draw Mr. Duxbury's attention to one point. That gentleman had said he did not see why the lighting consumer should be robbed for the sake of the gas-engine consumer. He (Mr. Meunier) was prepared to admit that he had learned his lesson from the electrical side of his town; and he had tried to arrive at some differentiation in cost between the lighting consumers of various grades and the power consumers of various grades. In this way he arrived at his fetish of the hour-load, because nothing that he had heard showed the contrary of his idea, which was that this load was the one dominant factor in the cost of supply. Mr. Duxbury himself had proved it when he made a special appeal to the Institution of Gas Engineers to move in the matter of emergency supply. He distinctly objected to having this capital spent upon plant which was earning no money. This was the very fundamental principle of the matter. Why should they do so? He was making nothing out of it, in any shape or form. Would not the same thing apply to the very large consumer of 100 million cubic feet a year, to whom Mr. Duxbury referred? He said this consumer should have his gas at a very low figure, because he needed less attention and book-keeping. He (Mr. Meunier) should like to know for how many hours this consumer burnt, and what was the size of the plant he required to have installed. When did he burn the gas? Was it in the winter or all the year round? On the emergency supply, they were earning nothing; on the contrary, they were paying something out of pocket. With the 100 million cubic feet consumer, it might be that he was burning, on an average, one hour per day, which meant a large number of lights and heavy consumption for one hour, and a very big plant. How was this brought about? It was consuming gas for lighting purposes for three or four months, and then nothing for the remainder of the year. Was not this plant standing idle earning no money? He was still of his old opinion, and he had tried in every way to differentiate between the paying and the non-paying consumer. Now he would take the other side of the picture. Why should a man who burnt gas for 80 hours a week regularly and constantly be charged the same price as a man who only burnt five hours a week, taking exactly the same quantity of gas? Where did the difference in cost come in? If they had taken the trouble, as he had done, to work it out, they would very soon see. He endeavoured in his address to show that with a heavy lighting consumer, burning an hour a day, the cost on the plant amounted to 2s. to 2s. 6d. per 1000 cubic feet, while the standing charges were an infinitesimal decimal point. But when they came to take the small consumer, the lighting consumer—and there were no doubt plenty of them in Oldham—where did they find the difference? His cost of gas per 1000 cubic feet consumed was small compared with the great cotton-mills; but the standing charges were very heavy, because the book-keeping required amounted to so much more per consumer per annum, and this when it was divided among the consumers of 7000 cubic feet a year amounted to as much as 15d. per 1000 cubic feet. How were they robbing the consumer? They were making it out of the man who used gas for industrial purposes. Personally, he had never been afraid of suction gas, nor an advocate of coming down to such a figure as 10d. or 1s. per 1000 cubic feet. He did not think they had ever heard him say so. His point had always been that at 1s. 6d. and, in some cases, 1s. 9d., suction gas could be competed with successfully; and he was still of that opinion. But when it came to a question of an all-round price, he must say he did not believe in it. What he meant by this was that in an industrial town, or where it was not simply the question of a gas-engine user, though he did take 25 million cubic feet a year out of their department, there were others. There was the heating, which meant a great deal; and when they served one they must serve the others. Those were the consumers out of whom they made a heavy profit per 1000 cubic feet. Was it quite fair that they should rob them for the benefit of the lighting consumers? Why should they rob the man who was taking his gas for so many hours a week and so many weeks in a year, for the sake of the man who was going to burn it for an hour a day, and that at a busy time of the year, exactly when everybody else wanted it? Mr. Duxbury, of course, had to deal with some heavy lighting consumers; and he did not have very much in the way of heating or for manufacturing purposes. His gas-engine trade must be small, because the industry was such that it required very high powers. He thought probably Mr. Duxbury could tell them exactly that very few of the mills which he had to light up had less than 2000 H.P. Therefore, the competition of suction gas would not come in there. But he had a heavy lighting load; and, though he (Mr. Meunier) appreciated his point with regard to the saving in labour by having a large account coming in without very much trouble, he differed from him when he said the big consumers ought to be considered, because he was certain they were getting gas at considerably less than cost price—as he had said before, at the expense of the small ones. It was done in a town like his at the expense of the goose which laid the golden eggs. He hoped that Mr. Duxbury would excuse him for falling foul of him; but he had tempted him to rise and say what he had said.

The Hon. Secretary said they had had one point of view from Mr. Duxbury and another from Mr. Meunier; but he was one of those who came about half way between them. He wished to thank Mr. Stevenson for his paper, which contained a great many useful hints. They had had during the discussion the efforts of some of their friends to meet competition described as "feverish." If, however, some of them had been too hasty, others had been too dilatory; and while he could not agree with either extreme, his Company had (despite the warnings of their esteemed friend Mr. Thomas Newbigging) found the sliding-scale adopted by them to be to the mutual benefit of themselves and their consumers. The main questions before them were, What was the prohibitive price to keep out suction plants, and how soon could they come to it? Mr. Stevenson, in his sliding-scale, did not come near his minimum price of 1s. 6d., at which figure he said business was refused. Mr. Whatmough, according to the report of the discussion at the last meeting of the Institution, said that 2s. to 2s. 3d. would meet it. Mr. Robert Watson, who had evidently gone very exhaustively into the question, said 1s. 8d. to 1s. 9d., or from 2d. to 3d. in excess of what Mr. Stevenson said he lost business at; while Mr. Dugald Clerk stated in his address to the North of England Association that the price must be 1s. "Gas and Oil Power," in their issue of the present month, said the price must be 1s., and even 9d., to compete; and they called attention to the cost of Widnes and Sheffield gas—evidently with the intention of using these isolated and fortunately-situated undertakings as a lever for forcing down prices in other towns. The paper said that when the price reached 1s., there would be no use for suction plants. If, however, the figures of their own friends were reliable, they had no chance even with gas at 1s. 6d. or 1s. 9d. To many undertakings even this figure was out of all reason, if all classes of consumers were dealt with fairly. He noticed in "Gas and Oil Power" there was an extract from the "Standard" articles by Professor Burstall, in which he repeated the old cry of one B.H.P. at one-tenth of a penny; and then he went on to say: "The remarkable success of the suction plant seems likely to have a profound influence on the whole question of the generation of power. Up to the present, it had almost been assumed that the wholesale production of power in a central station and its distribution by electrical mains to the motors, constitute the cheapest possible means by which power can be obtained. On this supposition, enormous sums have been expended both by private companies and municipal authorities in the provision of large power stations and the laying down of expensive tracks of cables, together with the provision of motors to be hired out for the use of customers. Power has been sold at prices varying from about 0·6d. per H.P. up to about 1·5d., according to the locality. Comparison of these costs with that which can be obtained from the suction producer will at once show the utter impossibility of any competition from a central source of supply; and as the greater part of manufacturers require power smaller than 100 H.P. in a single engine, it is only reasonable to suppose that, as the suction plants become better known, they will to a very large extent supersede either electrical motors or engines driven with illuminating gas; and so say all of us." This paragraph interested them in two ways, as it showed a determination

to supersede both electrical and town gas driving; and while doing them a good turn by opening out the excessive cost of electrical driving, at the same time it did them no good in the last sentence. What were they to do to combat these figures? To state them in a discussion at a meeting of this description would not help them much, as they rarely went beyond the technical papers. But if they were to get (say) Mr. Watson's statements of the case published in such a paper as the "Standard" or the Engineering Supplement of "The Times," everyone would read them, and some benefit to the industry would accrue. It seemed to him that they were asleep. They had become so used to having no competitor that they had not realized, except in isolated cases, the seriousness of the position; and the sooner they set about publishing broadcast the opposite side of the case, the better it would be for all the undertakings they represented. He thought that the Institution should appoint someone to write a series of articles on the advantage of town-gas driving, which any enterprising newspaper would no doubt publish. The day had gone by when they could wait for business to come to them; and they must follow the methods of their American friends, and look for it. He was not in favour of panic prices for gas, as such a policy would only react on themselves, and bear unfairly on the lighting consumers, who were the backbone of their business. But a minimum figure could be found at which it would pay them to supply for long-hour loads by adopting some such method of calculation as suggested by Mr. Meunier in his Presidential Address in 1905, but modified considerably, as he was of opinion that the prices arrived at in his figures were of the panicky order, that insufficient margins had been allowed for in his capital charges, and that the allocation of his establishment charges needed considerable revision. As he had pointed out in his remarks on Mr. Newbigging's paper read in November, 1905, further experience of long-hour loads for manufacturing purposes had only proved the necessity of these corrections; and they were selling good quantities of gas at prices considerably higher than Mr. Stevenson's 1s. 6d. Turning again to "Gas and Oil Power," there had been published ever since the first issue a special table of the gas and power and light in various towns. Under Manchester, it stated that the cost per B.H.P. for electricity, at 1½d. per unit, was 1·23d.; for town gas, at 2s. per 1000 cubic feet, 0·43d.; and for suction gas, with anthracite at 22s. 3d. per ton, it was 0·119d. He had not checked all the figures in the table; but as Manchester gas was 1s. 9d. per 1000 cubic feet, and anthracite had been quoted to him at 32s. 6d. per ton delivered, the figures were evidently out of date, and required revision, when the Manchester figures became 0·38d. per B.H.P. for town gas, and 0·174d. for suction gas. There was a footnote which called attention to the advance in the cost of anthracite; but it would be much better if the table itself were corrected.

Mr. Brearley said, with reference to Mr. Kendrick's final remarks respecting the table published in "Gas and Oil Power," he (Mr. Brearley) wrote to that paper seven months ago, pointing out that their table needed revision respecting the Huddersfield price for power, which had been reduced to 1s. 6d., though it still stood in the table at 2s. 1½d. It was apparent that the magazine had had a large number of these tables printed, and that the time of revision was by no means often. It would not be a bad plan for the members of the Institution to point out similar discrepancies in their own cases, and then they could have the table modified, because at present it was entirely misleading, and injurious to them as gas engineers.

Mr. A. Botteley (Leek) said he had had some little experience of producer plant. Their own electricity works at the present time were taking some 6 million cubic feet of gas from them. They had 400 H.P., and were supplied with gas at 1s. 4½d. per 1000 cubic feet. They had been seriously contemplating, during the last few months, putting their own producer plant down. He had gone into the question with the Gas Committee, and was very much afraid that, in order to compete with the figures he had seen, they would have to reduce their price to 1s. 3d. They had also in the town a suction-gas plant of 48 H.P., and he was assured by a manufacturer that he was saving 50 per cent. on his gas, which he used to obtain at 2s. per 1000 cubic feet.

Mr. Stevenson, in reply, thanked the members for their kindly reception of his first effort at a paper, with all its imperfections. The discussion had been to him a very interesting one, and he would endeavour briefly to reply to it in the order of the speakers. The first criticism came from Mr. Tooley, of Manchester, who expressed much sympathy with him, and suggested that he had misdirected his energies, and could have better employed his time in other directions. He (the speaker) was afraid that the chief difference between Mr. Tooley and himself was that he had to sell his gas and Mr. Tooley did not. In Long Eaton, he had to ask for every bit of business, whether it was lighting or power; and the power business he had to see to personally. He had been very much struck by an article in the "Financial Times," giving tips to the conductors of the electricity undertakings in London, and advising the engineers to be in touch with all the customers personally, and not to leave things to canvassers. If Mr. Tooley could come to Long Eaton for a holiday for a week or a fortnight, he thought he could prove to him that his (Mr. Stevenson's) efforts had not been misdirected, for if ever there was a chance of getting a cooker in, they had one there; but if they could not educate the people in the use of the cooker, it came out. They had no dead capital. He thought that he was the first to follow the records of these cookers, because he had for some years been of opinion that much capital had been thrown away in a number of towns. Many a user of a slot meter had said that he must have a cooker, when he did not, in fact, use it. He believed he was the first in the country to send round a qualified lady lecturer to every house where cookers were used, and this was six years ago. It might be merely a coincidence that the Gaslight and Coke Company were now doing the same thing. He could assure Mr. Tooley that his efforts had not been misdirected in this matter. With regard to gas-fires, it was all very well to talk, but they were face to face with the fact that with gas-fires there was a very limited business. He did not know how it was in Manchester. Probably there they had differential prices for fires; but unless they had, they were certainly not going to have a very large volume of business. He was much obliged to Mr. Tooley for his sympathy, but he really did not need it. With reference to Mr. Mottram, he took very cheerful views, and in some respects he agreed with him (Mr. Stevenson). He evidently thought that half-a-loaf was better than no bread. Mr. Whatmough had said he would not like it to go forth from the meeting that it was necessary to reduce the price to 1s. 6d. to meet the competition; and he thought 2s. was quite low enough. But this was all a question of circumstances. Throughout the discussion, they ought to bear in mind the size of the plant, the number of hours it was running, and the purpose for which it was used. This would ultimately determine whether or not suction gas really paid. The circumstances varied very considerably. He must say he had no sympathy with people at places like Leicester and Nottingham, and those who had come right away from 1s. 6d. per 1000 cubic feet for small engines. Though it was very difficult to think that unbusinesslike practices should prevail in Birmingham, yet to him it seemed absurd to supply gas at 1s. 6d., because if they had electricity at ½d. or ¾d. per unit it was cheaper. Mr. Watson had stated his experiences with regard to Doncaster, and had given the tests of the Royal Agricultural Society at the Glasgow show. The great mistake that suction-gas people made—of course, it was a mistake made purposely—was that they said the cost was 10 to 20 B.H.P. for 1d., or whatever their imagination went to. This was only half the tale. It was quite wrong to say that one could get even 10 B.H.P. for 1d., because if the tests made at the Society's show at Derby (by Captain Sankey and Professor Dalby) were taken, and the consumption of coal per brake horse power were looked at, it was found that, working at full load, it came to 1¼ lbs., and on the half load the average was 1·69 lbs.; so that when they saw the big 1d. at the railway sidings they would know that it was not all the tale. It was like that which always obtained with water gas. They put a very large value for reflex advantages, and that sort of thing; but, as a matter of fact, the competition was such that it required careful looking into. He thought Mr. Watson's figure for the cost of the plant per brake horse power was too high; and therefore the capital charges would be rather less than he had stated. With regard to labour, he had not put on enough for it. He (Mr. Stevenson) did not propose to go into these delicate calculations, because it was more with the idea of looking at the matter from the commercial than from the severely technical point of view that he had submitted his paper. Mr. Watson thought they could compete very favourably with gas at 1s. 8d. to 1s. 9d. per 1000 cubic feet; but there was a good deal in gas which could be put down to what Mr. Kruger called "moral and intellectual damages." There was very much more satisfaction in the use of town gas. He had already explained that his price was not 1s. 6d. for any size. Consumers had to use 1½ million cubic feet a year before they could get the gas at 1s. 6d. In his opinion, differential rates were bound to come about. He was very much struck with the President's address, where he said that conservatism was a dominating characteristic of the gas business; and then he added that the philosophy of to-day was the common sense of to-morrow. This, he thought, would hold good with regard to differential prices. In framing his price for gas, he worked it out carefully to see where he was the most hit—where competition was the keenest. He had not the least doubt that his eighteenpenny consumers paid him better than any part of his business. They had a 15 to 20 hour load. There was no cost upon it, and there was no capital expenditure as compared with slot meters, with all their attendant outlay. At any rate, he knew which he would sooner have. The reduction in his price had brought him a large volume of business, which was paying him well. Mr. Duxbury had stated that all their competitors had gone to the wall. This was rather news to him, because he found that in most big towns the cream of the lighting department was swallowed up by electricity. From his observations during the short time he had been in the gas business, it seemed to him that wherever there was a big electricity supply the larger consumers went in for it. Mr. Duxbury seemed to be of opinion that they had magnified the competition; but he did not think this was the case. Even if they had done so, was it not better to face the thing, and try to conduct their business on commercial lines, so that they might be able to meet it? Did it not clearly point out the trend of their present industry—namely, that they had to aim at bringing the cost of the gas into the holder as low as possible, getting the utmost value out of their residuals, and making their power load more equal to the load-factor of their works? There was much to learn from the electrical people; and he entirely agreed with Mr. Newbigging when he suggested that every member should work out his costs upon this basis. It was rather a formidable undertaking for some of them; but he could assure them that it would reveal side-lights which would surprise them.

He could understand Mr. Duxbury not wanting to reduce his price at Oldham, because there they had mostly small gas-engines. He said that many were under 20 H.P.; and, of course, they were out of court for suction gas. He had alluded to the "emergency" supply; and it was a very great hardship to have to supply gas for emergencies. But at the same time his practice now was to strike a full blow, and to have some excuse for not coupling up till they were in the worst plight, and then dictate his own terms. Mr. Kendrick had referred to Mr. Burstall's remarks; but with regard to them, he (Mr. Stevenson) would merely be repeating what he had said formerly—namely, that he had only told half the tale. It was a surprising thing to him that such a statement should go forth, because it was really not half the truth. Mr. Botteley said he was selling gas at 1s. 4½d. per 1000 cubic feet; but he did not say whether he could afford to sell it at this price. He (Mr. Stevenson) could in his own case; but it was not everyone who could do so. He could point to places where they were selling gas at 1s. 6d. at a loss. He could afford to do it, because his cost into the holder was 8d. per 1000 cubic feet. What would be thought of a supplier of electricity selling at less than ¾d. per unit, when the cost was ¾d., the distribution another ¼d., and interest and capital more than 1d. ?

SOME NOTES ON HIGH VERSUS LOW GRADE GAS.

Mr. ALLEN (Liverpool) read the following summary of his paper presented at the previous meeting, when the author was absent, owing to indisposition.

The introduction referred to the general movement in a downward direction in respect of illuminating power, so that gas could be sold at a reduced price.

It was stated that this policy was inaugurated before incandescent gas lighting was generally accepted as a practical success; but it was admitted that the promoters had faith in that system, and therefore strongly advocated a reduction in the standard of illuminating power. It was pointed out, however, that in the interval between the date of such reduction and the general acceptance of incandescent gas lighting, many customers went over to the rival illuminant (electricity), but that the gas industry reinforced by its ally (incandescent gas), then fully equipped, had not only rallied in the fight but turned an impending defeat into a glorious victory.

The great advantage of Dr. Auer's invention is that it enables very great illumination to be obtained from very low-grade gas; the improvements not being a matter of percentages but of geometric progression. Therefore the advantage gained by the use of a low-grade gas in an incandescent burner as against a high-grade gas in a flat-flame burner, is enormous.

The question dealt with in the paper, however, was the comparative values of high and low grade gases for lighting and heating purposes in Liverpool—the illuminating power being 20 candles and 16 candles respectively as tested in a flat-flame burner.

In respect to lighting, it was stated that experiments were made at the Garston works, which showed that the low-grade gas was less efficient than the high-grade gas when used in an incandescent. burner, by 14·94 per cent., and that the cost of light per candle per 1000 cubic feet, allowing a reduction of 2d. in the price, was—

20-candle gas.	0·4016d.
16 ,, ...	0·4400

The net increased cost of light given by the low-grade gas being 9 per cent.

Another table shows the result of experiments made at the Linacre works by which the Garston results were confirmed. The other tests of still lower grade gases pointed in the same direction.

The conclusion is drawn that it would not be in the interests of the consumer of gas for lighting purposes—whether in flat-flame or incandescent burners—to reduce the quality from 20 to 16 candles.

As regards heating power, a slight gain of about 2¼ per cent. would accrue to the consumer by the change to low-grade gas; but as the bulk of gas in Liverpool is used for lighting purposes, the balance is in favour of retaining the present standard.

The author calls special attention to the fact that his paper has sole reference to Liverpool, and he declines to dictate to those in charge of the gas supply of other towns.

Discussion.

Mr. R. G. SHADBOLT (Grantham) said that in an early part of his paper Mr. Allen remarked that the incandescent burner used with regard to the first set of tests was a Welsbach "C" burner, rated to 3 cubic feet per hour, and the air supply was regulated to give the best results in each case. He should like to ask whether this practice had been followed throughout the tests with all the grades of gas.

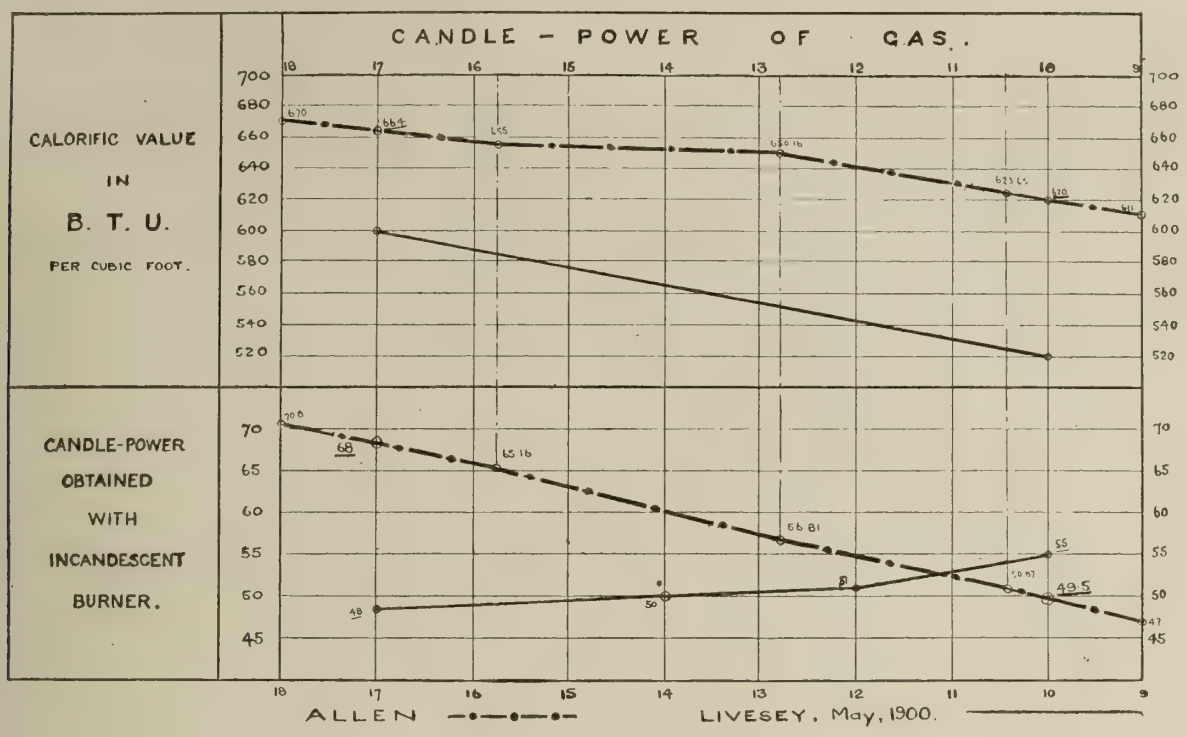
Mr. ALLEN said that was so.

Mr. SHADBOLT remarked that the *crux* of the whole question, of course, was, as Mr. Allen very tritely put it, the suitability of their commodity to the best interests of the consumer. On this point, they would all be agreed to begin with. He would pass over the exceptional difficulty just admitted by Mr. Allen with regard to the comparative cost of making 20-candle gas. The comparative value of lights which he gave was simply an exercise in proportion—it was nothing more and nothing less; and it might mean anything or nothing. He thought in the arbitrary standard of 3 cubic feet per hour, to which he had alluded, there was disclosed a mistake that vitiated the whole of the tests that followed. Taking the second set of tests, they ranged practically over different grades of gas from 20 candles tested with the argand burner down to 10 candles as tested by the argand burner. There they had a big range over which these tests extended; and yet with one identical burner, which was nominally, he supposed, to consume 4 cubic feet an hour of 16-candle gas, they had an arbitrary standard of 3 feet per hour both with the 20-candle and the 16-candle gas, and merely with an adjustment of air to get the best results obtainable with a fixed standard of gas supply and with a fixed mantle. These were not results which would give the proper value of the illuminating power obtainable from the gas used as it ought to be consumed in an incandescent burner. To simply fix the consumption of gas and regulate the air supply, seemed to be as rational as it would be to consume 4 cubic feet in a "C" burner, take a photometrical test, next reduce the consumption to 2 cubic feet and adjust the air supply, and then expect to get half the amount of light. This was the *crux* of the question—not only regulating the supply to get the best consumption of gas, but adopting the shape and size of flame to the mantle. Taking the principle of intensified lighting as at present in vogue, they went up to very high pressures, simply to get the added volume of air in the gas used. With the ordinary "C" burner, it might be taken as a general rule that there were 4 to 4½ volumes of air to 1 of gas. The quality of the gas had nothing to do with these proportions—it was the injectors formed by the jet. By increasing the increment of air from 4 to 5, one reduced the length of the flame, and was able to consume more gas in a given size of flame. The photometrical duty would be a higher duty, but only in the gas consumed; so that one got from 20 candles per foot per hour up to 40 candles with intensified lighting, not because the quality of the gas was altered, but because means—mechanical or otherwise—were taken for introducing a larger proportion of air as against the proportion of gas, in addition to a larger total quantity. This was where he thought Mr. Herring, in that valuable paper of his, given before the North British Association in July, was dealing with a point not touched on before—viz., that there was another factor besides the calorific value of the gas, and that was what he termed the flame volume. He should like to compare the tests. Those before them that day referred to Liverpool, and the others referred to Edinburgh. Each of these two sets of tests was taken as given by the two authorities under certain conditions which they had explained to them. Mr. Herring made this difference—he was not content simply to regulate the supply of air with the gas, but he also adjusted his supply of gas, so that the mantle was thoroughly enveloped. If they referred to the tables, it would be found that with gas of 15½-candle power up to about 20-candle power, they secured practically the same results per foot per hour by adjusting, not only the air supply, but the gas supply as well. He evolved from this his theory that flame volume had a great deal to do with it. The rates of consumption per hour over these tests were also very curious. They ranged from 2·89, the lowest, to 3·40 cubic feet per hour. These consumptions had little in common with the illuminating power as tested by the argand burner—that was to say, the 16-candle gas in one case might be very different from that in another, and the adjustment of the gas and air to obtain a given flame volume and to secure for the mantle its maximum, depended on the composition of the tested gas. The table was an interesting one, and threw a glaring side-light on the conclusion which Mr. Allen had put before them. Mr. Allen said that the conclusion was inevitable—namely, that 20-candle gas was the cheaper; but he did not think that was so. His tables showed that from July to November, 1905, practically the 17-candle gas as tested in the argand burner showed a loss of 13 per cent. The tables indicated a progressive deterioration as they came down in the scale of illuminating power. This was simply because the gas was not adjusted properly. It might have required a greater quantity of gas to have fully illuminated the mantle to obtain the best results; but there would have been a greater and still more powerful light. He had taken a No. 4 mantle, to see what light could be obtained from it under the most favourable conditions normally. Much more gas could be consumed if means were taken to introduce into the burner an increased proportion of air; and thereby an increased total lighting duty for the mantle would be secured. At the same time, the various means of concentration which were adopted brought about greatly increased illuminating power per cubic foot of gas. Mr. Herring's tests were taken with a different burner; but his results were all comparable, as also were Mr. Allen's. The phenomenon of the people of Liverpool preferring that "burnished gold" appearance given by the flame burner was a mark, he supposed, of the visionary age in which we lived; and it was possible that this figure of Mr. Allen's might be handed down to posterity as the last languishing glow of that sun which sets above the horizon. Did it not appear strange that, despite the pale moonbeams which were supposed to emanate in Liverpool from the incandescent burner, the people—even given the burnished gold appearance—should prefer 4 candles when by the tests shown in this paper they could obtain four times more light by using the incandescent burner? Surely, under these unfair conditions, the people of Liverpool were too much alive to their own interests to any longer prefer the ball of burnished gold to

those moonbeams which could be obtained at a much lower cost to them. His observations of the subject of gas in incandescent lighting led him to think that the richer the gas was as an illuminator *per se*, the more difficult it was to use it in an incandescent burner under normal conditions. They should bear in mind that these tests were all of them made in a laboratory, the mantles new, the burners clean, and so on. They might send out into every-day use new burners adjusted to suit the heavier gas, and they might give at the moment a better lighting duty per cubic foot than the burner using the poorer gas. But when they had been in use some little time, it would be discovered that at the outlet of the burner there were deposits which would retard the mixture of gas and air. With the lower-grade gas, this did not apply to the same extent. With the richer gas, though one had a better light when everything was clean and in order, with the lower-grade gas the light might be better with the life of the burner. He had noticed in towns in which they still had the higher standard, where incandescent mantles were used there was much more dirt thrown on the ceilings. He thought that these were great factors which affected the use of electric lighting in those places, and that customers still preferred in many instances to use the flat-flame burner. What was needed, he thought, was for them, as gas men, to study these questions with the view of discovering what the factors were which regulated the efficiency of these burners in every-day use, rather than in laboratory practice; and, having ascertained this, to teach their consumers, or, if they could not do that, to provide a staff sufficiently qualified to enable them to adjust the burners to meet the local requirements in the best possible way. If this were done, he thought it would be found that the lower-grade gas would compare much more favourably than was shown by the tables Mr. Allen had put before them, the results of which were much depreciated by the fact that the gas supply was not adjusted as well as the air supply.

Mr. Isaac Carr (Widnes) said, not only the Institution, but the gas profession generally were indebted to Mr. Allen for having brought this subject forward. It was one of the greatest possible importance, and yet was one that was least understood. He had listened with some little surprise to the remarks of Mr. Shadbolt, who had told them that, by adjustment, the results from incandescent burners could be changed or altered. Still, Mr. Shadbolt did not for a moment deny that the whole source of the light in the burner was a matter of heat, and that the poorer the gas the poorer the results. These conditions must apply in proportion. This brought him back to the question in the paper. The author stated that the question of high and low grade gas was one of general concern to those who were responsible for its manufacture and supply. Leaving incandescent burners out of the question for a little while, one might look for a moment at the pleas that were put forward on behalf of low-grade gas. Some of the pleas were that the consumer with the unmentionable flat-flame burner, which was supposed to have gone out of existence, would get as good results, or better, with a good burner, because he nearly always used a bad one. Then it was argued that low-grade gas would force the use of the incandescent burner; and it had been said that low-grade gas was as good as high-grade gas, and that having regard to its use for industrial purposes it was quite as good a servant. This was really the point. In his judgment, it was not so. The higher the quality of the gas, the greater the value to the consumer for whatever purpose it was used. Of course, in illuminating power the flat-flame burner was the greatest sufferer by a reduction in the quality; but for other purposes the calorific value of the gas was a gauge of its usefulness. It had often been said that calorific value bore no relation to illuminating power. This was quite true when comparing gas made from different coalfields and very different methods of production; but where the conditions were comparable, there was undoubtedly a relationship between the illuminating power and the calorific value of gas. He had found in his experience—and he had made hundreds of tests—that the calorific value rose with the light-giving quality of the gas. He had before him a diagram that was brought under the notice of the gas industry in a lecture delivered before the Gas Institute in June, 1900, and he saw that it had since been styled the Magna Charta of the "new" gas industry. In this diagram there was a fall in the illuminating power of the gas from 12·7 to 2 candles, and a fall in the calorific value from 600 to 553 B.Th.U., while the illuminating power in the incandescent mantle had increased by 15½ per cent. It was a pity the gentleman who had conducted the experiments (Herr Schäfer) had not continued them, because with one line going down and another going up, they would soon have got excellent results from nothing; and it seemed to him that it was unfortunate that they should stop where they did. His own observations in connection with the calorific value were not in accord with Mr. Allen's. He was very much surprised to see so small a range of difference in the calorific value as Mr. Allen had given. He had found the 20-candle gas made from coal and cannel grew to about 700 B.Th.U., whereas he (Mr. Carr) had never been able to get more than 560 B.Th.U. from the lower-grade gas which was given in the table as nearly 100 B.Th.U. more. This only showed the difference in the position of gas as affecting the calorific value. Then his own tests with incandescent burners had been very numerous. He had found a falling-off by making the best possible adjustment and varying the supply to the best conditions. He had never kept to a fixed consumption, but had always tried to get the best adjustment he could of the air and gas; and he had found a falling-off of about 2 per cent. in the light from an incandescent burner. The author had made reference to Widnes, and fell into the old fault of the "Gas World" of over-stating his prices; and, not content with this, he also under-stated his quality. He (Mr. Carr) wished to repudiate the suggestion that in Widnes they supplied a low-grade gas. They did not, as a fact, do so, and had never intended to. If the quality of the gas at Widnes was not to be compared with that of Liverpool, so much the worse for the consumer. Another point on which he was at issue with the author was this. He said in his paper: "There is no gas so closely tested by the public officials as that of Liverpool, and their evidence year after year is eminently satisfactory." On this he was at issue with the author, because he (Mr. Carr) said there was no gas so closely tested as that at Widnes; and he might go on to say that the evidence year after year was eminently unsatisfactory. With regard to testing gas, the author's own Company had secretly maintained a testing-station in his (Mr. Carr's) own town in the time of his predecessor; but whether or not this existed there now, he did not know. His gas at Widnes had for years and years been regularly and secretly tested by their friends. There the hosts of Sir George Livesey had gone away with the results which he supposed were eminently unsatisfactory to him (Mr. Carr), but most probably eminently satisfactory to themselves. Only last year had he survived the rearward attack from Bolton. He no sooner recovered from it than he found himself attacked from Southport. He believed these earlier tests had been carried out in the daytime; but the gentlemen from Southport sat 24 hours on end testing, while he (Mr. Carr) was in bed and sleeping. Those who talked about severe testing did not know what it was. This question of high *versus* low grade gas was a matter of importance to them at Widnes, because there they spent money on enrichment which might be given to the consumer in the form of a further reduction in the price of gas; but he believed if they did this the consumer would be worse off. In his opinion, the consumer was better off by having the money given to him in the form of enrichment than by a reduction in price; and for this reason they would continue to maintain, and not depreciate, the quality of their gas. He trusted that, from the unfortunate results which had arisen from a severe reduction in the quality elsewhere, it would be seen that it was a great mistake, and would in future be avoided by the gas maker, in the best interests of himself and the consumer.

Mr. J. G. Newbigging (Manchester) said the ground had been pretty well covered by the last two speakers; but he had prepared a few notes on the subject before them from his own point of view. He considered the question of high *versus* low grade gas was undoubtedly of the greatest importance to gas undertakings, and demanded their most serious consideration. Mr. Allen had rightly stated that no hard-and-fast rule could be laid down to apply to all gas undertakings as to the quality of the gas to be distributed, but that the matter must be decided on the conditions and circumstances existing in each locality. The *crux* of the whole question was that, if a reduction in the illuminating power was contemplated, the full difference in value to the consumer could be given in the shape of a reduced price. It was necessary that the question should be looked at solely from the point of view of the consumer, or they would be playing into the hands of their competitors, and would be losers by the change. If this reduction in price could not be made, then to take the step of reducing the quality was unwise. Mr. Allen had said that ½d. might be taken as the cost of each candle between 16 and 20 candles. This might apply to large undertakings where carburetted water gas was manufactured; but it did not apply to the average works where cannel or benzol was depended upon for enrichment, and therefore for the majority of gas-works the cost of 1d. per candle still applied. He knew it was stated that benzol enrichment was carried out for less than 1d. per candle per 1000 cubic feet; but he had not found it so in his experience, especially when the make of gas per ton was high, and a low initial quality was produced. The cost of enrichment with cannel was higher than this; but it was more efficient and more permanent. Therefore, he should reckon the difference in cost between the 20 and 16 candle gas at 4d., as against Mr. Allen's 2d. Then, referring to Mr. Allen's figures, he (Mr. Newbigging) found that the tests he carried out in comparing the 20-candle and 16-candle gas at the Linacre works between July 18 and Aug. 4 showed a falling off of the lower quality gas when tested with the batswing burner of 21·5 per cent., in the incandescent burner of 13·2 per cent., and the loss in calorific power 4·38 per cent. Taking the 20-candle gas on the basis of 2s. 6d. per 1000 cubic feet, the 16-candle gas should be sold at 1s. 11½d. per 1000 cubic feet for use in the flat-flame burner, 2s. 2d. in the incandescent burner, and for heating, cooking, and motive power at 2s. 4½d. This was shown in Diagram No. 2. So that if Mr. Allen supplied 16-candle gas at 2s. 2d. per 1000 cubic feet, or even at a higher price, as he would show, it would be obviously to the advantage of all his consumers, with the exception of those who used flat-flame burners; and in spite of Mr. Allen's advocacy of the "beautiful flat-flame burner," he hoped the number in use would grow beautifully less as the years went by. With regard to the tests made with the two gases in an incandescent burner, Mr. Allen had stated that they were carried out with a Welsbach "C" burner, rated to 3 cubic feet per hour—the air supply being regulated to give the best results in each case. He had carried out similar tests under similar conditions with pretty much the same results. It occurred



NOTES.

	Livesey. Per Cent.	Allen. Per Cent.
17-candle gas is taken as the starting-point in percentages.		
Difference in candle power of gas between 17 and 10 candles . =	41·2 reduction	41·2 reduction
,, calorific ,, (B.Th.U.) ,, ,, ,, . . . =	13·3 reduction	6·6 reduction
,, illuminating power with incandescent burner . . =	14·7 increase	27·2 reduction

Note.—Livesey's rate for incandescent burner = 3·5 cubic feet per hour.
Allen's ,, ,, ,, ,, = 3·0 ,, ,,

	B.Th.U.	B.Th.U.
Calorific power of 17-candle gas.	600	664
,, ,, 10 ,, ...	520	620
	Candles.	Candles.
Illuminating power with incandescent burner with 17-candle gas =	48	68·0
,, ,, ,, ,, ,, ,, 10 ,, =	55	49·5

to him, however, that perhaps this was not really giving the lower quality gas a fair chance; so he instituted recently some tests with a Bray incandescent gas-burner, adjustable both for gas and air supply, and had found that over a considerable range of gases of different candle powers—4 to 5 candles difference—the efficiency per cubic foot of gas consumed was the same when both the gas and air supplies were adjusted to suit the gas under test. These tests were still being continued, so he preferred not to give any definite figure for the moment. Calorific value was not the main factor; it was a question of flame temperature. Some of them would likely remember the paper read by Sir George Livesey before the Institution of Gas Engineers in May, 1900, in which he stated that a 10-candle gas was superior to a 17-candle gas when used in an incandescent burner. He had obtained, with a consumption of 3·5 cubic feet, 48 candles, or 13·71 candles per foot, with the 17-candle gas, and 55 candles, or 15·71 candles per foot, with the 10-candle gas. He was sorry to say he had not been successful in obtaining such figures, but had evidently struck a middle course between Sir George Livesey's and Mr. Allen's results. The figures were so interesting that he had had Sir George Livesey's and Mr. Allen's results placed together in a diagram. Mr. Allen's own tests showed that 16-candle gas at 2s. 4d. per 1000 cubic feet was cheaper to the consumer for cooking, heating, and motive power than 20-candle gas at 2s. 6d. per 1000 feet; and in view of the results he had obtained with the incandescent burner named, he had not proved to his (Mr. Newbigging's) satisfaction that this did not also apply to those who used incandescent burners. He had simply proved that the higher quality of gas was cheaper to those consumers who continued to use the flat-flame burner, which he thought no one would dispute. But were consumers of gas for lighting with the incandescent burner and for cooking, heating, and motive power to be penalized for the sake of the flat-flame consumers? As a matter of fact, the latter was penalizing himself by paying from four to five times as much as he need do per unit of light. It was, of course, in some cases difficult to use incandescent burners, owing to vibration, &c.; but these instances were becoming rarer every day, owing to the introduction of appliances to obviate the difficulty. Of course, if Mr. Allen could persuade his consumers to continue the use of the flat-flame burner, which gave a light "like a disc of burnished gold," instead of the incandescent burner with less consumption of gas and consequently less vitiation of the atmosphere of the room in which it was used, well and good; but knowing, as he did, the great saving which had been effected in many cases by substituting the incandescent burner for the flat flame, he thought some consumers would consider it all moonshine if attempts were made to persuade them to revert to the old order of things. There was no doubt that the inclination was to go too far with this reduction in illuminating power; but there was a middle course which was of advantage to both the manufacturer and the consumer. They were much obliged to Mr. Allen for his paper; but he had made out a poor case, even for his own district, in continuing to distribute such a high quality of gas as 20-candle power.

The HON. SECRETARY said it seemed to him that Mr. Allen's statement, that the point of view he enunciated only concerned Liverpool, was intended to disarm criticism. The paper bristled with controversial points; one of the first being that, with the flat-flame burner, 10 candles per 4 cubic feet was all they could get. With the adjustable burner, they could regularly obtain 12 candles per 4 cubic feet and 15 candles per 5 feet, using an 8 top on a 4 bottom. He also made a great error in history. The demand for low-grade gas followed the incandescent burner, not the incandescent the low-grade gas. What was low-grade gas? To Mr. Allen and the advocates of 20-candle gas, 16-candle gas was low grade; to others, who had supplied 16-candle gas for decades, it was 13 and 14 candle gas; to the Scotsman, 20-candle gas was low grade; and until they got a definition of low grade, the term was far too elastic for general use. Again, various methods of testing made a difference; and there could be no actual comparison between different towns. When a new Gas-Works Clauses Act made it compulsory for everyone to use the No. 2 "Metropolitan" burner, uniformity would be attained. The question was not between the relative cost of illumination by flat-flame and incandescents when using 20-candle gas, but between 20-candle gas in the flat-flame and 16 candles or lower in the incandescent burner. Comparing Mr. Allen's figures on this basis, they got: Flat-flame burner, 20·6 candles at 30d. = 1·456d. per candle; incandescent burner, 63·54 candles at 28d. = 0·440d. per candle. The incandescent burner was 3½ times cheaper, light for light, than the flat-flame. There were other points about the tests which he could not understand. There was the loss of efficiency. Mr. Allen gave in his tests of gas made of different qualities the loss in actual B.Th.U. and the loss in efficiency for 16-candle gas. The loss of light in the incandescent burner compared with 20-candle gas was 13·2 per cent., and of calorific power only 4·38 per cent.; compared with 12-candle gas, 23·21 per cent. and 5·08 per cent.; with 10-candle gas, 30·80 per cent. and 8·95 per cent.; and with 8-candle gas, 39·86 per cent. and 12·18 per cent. There must be something wrong there. The incandescent burner depended entirely for its illuminating power on its flame temperature; and as this would practically correspond with the

calorific power of the gas employed, the loss in efficiency should not be very much more than the loss in heat units. But perhaps Mr. Allen would explain this difference. The author also said that the 20-candle gas required practically the same quantity of air as 16-candle gas; but as the former contained 35 per cent. of carburetted water gas, and the latter 50 per cent., he should not have expected it—in fact, the more there was in the mixture the less air was required for complete combustion. A few tests with the No. 2 "Metropolitan" burner would prove this over and over again. If they knew how the 12, 10, and 8 candle gases were produced, they might be able to follow the other tests better. Probably the mode of manufacture had some bad effect on the heating value; but as 10 and 8 candle gases were not within the range of practical politics, they need not trouble themselves much about these figures. The others, however, were so self-contradictory that they could not be accepted as absolutely reliable. He had made a number of tests with a Kern burner on gas of 17·55-candle power containing 35 per cent. of carburetted water gas; the calorific power being 562 to 572 B.Th.U. net, the indicated illuminating value for 4·07 cubic feet per hour being 75·68 candles at the higher, and 71·28 candles at the lower calorific power. The air supply was not altered; and the heat units per candle were 7·88 and 7·56 B.Th.U. respectively. When, however, the air supplies were varied, the results became regular, and they distinctly improved. Then by altering the air supply to less than 12 per cent. in one case and more than this in the other one, the illuminating power became 79·2 candles and 80·8 candles respectively, or 7·01 B.Th.U. per candle in each case. Reducing the air still further by 25 per cent., the illuminating power became 76 candles; and by 35 per cent., 68 candles. With another make of burner, by increasing the air supply to double its original quantity, the illuminating power of the mantles rose from 63 to 65 candles; while the consumption dropped from 4·4 to 3·6 cubic feet per hour. In this burner there were five air-holes; and the illuminating powers with one, two, three, and four closed were as follows: Full open, 65 candles; one closed, 62 candles; two closed, 58 candles; three closed, 56 candles; four closed, 47 candles—the consumption remaining constant throughout. Upon these results, it was evident that the air supply was increased too much; but as the burner was one of a type in general use, it afforded a good index of what could be done by generally increasing the air supply. These remarks did not, of course, apply to such a burner as Bray's, which had an air-regulator. He had gone into this question so much with the view of following up the trenchant criticism of the "Gas Journal" on Mr. Launcelot Wild's tests. He had been able to obtain in regular practice fully 7 candles per foot more than he showed with the Kern burner and 2 candles per foot with the "C" burner. It was unfortunate for the gas profession he had copyrighted the books, otherwise he was afraid there would be worse things in store for him than the very severe handling he had already received; but the fact that these figures would be used against them by their rivals, the electricians, must put them on the *qui vive* and scotch the wheels before they had got beyond their reach.

The President said all would be agreed that they had had a wonderful discussion that afternoon—proving what statisticians could do with statistics under certain conditions. The mere fact that there were these tests, made them wonder where a comparison was to be started and finished. He was very much struck with the fact that so prominent a man as Mr. Launcelot Wild had lent his name to such figures as has been stated by Mr. Kendrick, because they were perfectly alarming. There would really be no illuminating power in their gas if they were to take the figure he named in his authoritative tests, as he called them. He was personally very much obliged to the readers of the papers, which had been productive of good discussions; and he trusted that they would be favoured with many more of a like character.

Mr. Allen, in reply, thanked the various speakers for the way in which they had criticized his paper. Mr. Carr seemed to think that his remarks with regard to high-grade gas had simply reference to Widnes; but it was nothing of the sort, as would be seen on reference to his paper. When he said, "In that field high-grade gas is almost useless," he did not suggest for a moment—though such an inference was capable of being drawn—that there was not high-grade gas at Widnes. Mr. Carr said there was high-grade gas there; and he knew more about it than anyone else. He could assure Mr. Carr that he did not intentionally connect Widnes with low-grade gas. This had been the only bitter feeling introduced in the discussion; and he thought it represented rather more heat than illuminating power. He thanked Mr. Shadbolt for the able criticism of his tables. He was very glad that Table No. 2 and the experiments at Linacre had been referred to in the paper, otherwise he was afraid that there would have been nothing to criticize. He did not place any reliance on the figures resulting from the tests made at Linacre. His reference to the deduction drawn from the process followed was entirely taken from the experiments with the 16-candle flat-flame burner, for the reason that it was not possible to test with a lower quality than 16-candle gas in Liverpool. This was a very low-grade gas for Liverpool; and therefore it was that in his paper he had more than once asked them to consider that the question had reference to Liverpool, and not to Manchester. Liverpool was unique in that for many years 20-candle flat-flame gas had been supplied; and the Liverpool public, who had flat-flame burners to-day, would not part with them—they admired the golden light. The Engineer himself directly, and through his Assistant, endeavoured constantly to induce the consumers to use incandescent burners. His paper distinctly realized the greater efficiency obtained by any gas in an incandescent burner than in a flat-flame one. When he spoke of getting 10-candle light for 4 cubic feet from a flat-flame burner, this was with a common low-grade gas. In Liverpool, they gave a man 16 candles in a flat-flame burner; and that man loved it, and would not part with it. Anyone going to Liverpool would see public-house after public-house with flat-flame burners giving a glorious light. If the manager was asked, "Why do not you have incandescent burners?" he would say: "We will not have those wretched cold things. The parlour is cosy with a flat-flame burner, but it is not with an incandescent burner." If one went to a butcher and said, "Why have you got flat-flame burners? Why do not you have incandescent lights?" he would reply: "I could not sell my meat with them. A flat-flame gas-burner gives such a curious light that the meat is worth 1d. a pound more." It was not possible to coerce a customer. One might agitate; but one must not say, "I will not give you this beautiful golden flame." Some years ago, the experiment was made of giving a certain section of Liverpool over 20-candle carburetted water gas, the density of which they knew was very great. The result was that when a man was passing 4 cubic feet of gas through a flat-flame burner, he only got 3 feet through, with the consequence, of course, that the light became very much worse. They had shoals of letters asking for the old gas; and for eighteen months they were doing nothing else but going round the district sending men about to take off the small burners and put on the large ones to give the old light. They had some difficulty in explaining that they were not burning more gas with the large burner. This experience would show what would happen if they brought their quality down from 20 to 16 candles. He had not had a complaint about the quality of their gas for many months, and yet there were numbers of people using only flat-flame burners. He would repeat what he had said in his paper—they must endeavour to try and suit their customers. It was not an engineers' question entirely, it was a directors' question. He had no desire to criticize the policy of his Directors. The tests tabulated in Table II. were simply experiments made with various qualities of gas squeezed to get the uniform rate. With regard to the air required with 16-candle gas as compared with 20-candle, the latter had 50 per cent. of carburetted water gas, which required less air than the coal gas; and it appeared that the smaller percentage of hydrocarbons in the 16-candle gas called for less oxygen. As a matter of fact, when one endeavoured to alter the air supply in a burner after trying one gas and testing the other, it was found that it did no good whatever. They had attempted to get the best results with 16-candle gas and 20-candle gas. The second table was only useful in so far as they cared to make use of it. In reply to Mr. Shadbolt, he might say that his results were not obtained with new burners or new mantles; the tests were all under ordinary conditions. They had a new mantle to start with, but it was used again. They had got as high as 30 candles, and it went down as low as 25 or 26. It was only when the mantle showed deterioration that a new one was put on. The burners were not new; but, of course, they were cleaned and blown in the ordinary way when the mantle was changed.

Mr. Shadbolt asked whether the burners were burning the whole time, or only during the test.

Mr. Allen replied that the burners were in use during a large portion of the time when no tests were being made. No doubt, one might have a burner that was not suitable for rich gas; but there was not this trouble at Linacre. When a consumer complained about his burner being choked, he invited him to step outside and inspect the public lamps, which gave no trouble at all. People who used flat-flames had great confidence in them. One old lady, when recommended to make a change, said she had had her burner for thirty years, and did not intend to get rid of it. With regard to what Mr. Carr said about secret testing, it was possible that the Southport people had a good reason for testing for 24 hours; but, he must say, that whatever tests were made by Liverpool were made honestly, and extended throughout the hours of darkness only. The tests were quite satisfactory, and enabled them in Liverpool to realize why the Widnes gas was sold at a very low price. Mr. Newbigging put the case in a nutshell, when he said there was no hard-and-fast rule, and that every manager must be guided by local circumstances. Carburetted water gas could be made cheaper in Liverpool than coal gas; and but for this they would have to sell nearly 1500 tons of coke more per week than they were at present selling. With regard to the use of cannel and benzol, all those who were looking with dread to their purchases of coal next year would be much easier in their minds if they used a larger amount of cannel. The cannel market was not going up; and those who were using it were much obliged to those who were not. It was cheaper to make 1000 cubic feet of gas from cannel to-day than it was to make that amount from coal—taking both the quantity and the quality into consideration.

Vote of Thanks.

Mr. J. H. Brearley then proposed a hearty vote of thanks to Mr. Stevenson and Mr. Allen for the papers which they had read.

Mr. Duxbury seconded the proposition, which was carried unanimously.

INDIA-RUBBER JOINTS FOR MAINS.

In the last number of the "JOURNAL," we gave (p. 465) an abstract of a paper on the above subject read by Herr Burgemeister, of Celle, before the Association of Gas and Water Engineers of Lower Saxony. In view of the change in the character and the increase in the quantity of traffic now passing along the main thoroughfares of towns, the effectual junction of mains becomes of greater importance than hitherto; and consequently any material that helps to ensure soundness deserves attention. We therefore supplement the particulars given last week by some received a few months ago from a correspondent in South America, who has had opportunities of testing the value of india-rubber joints for gas-mains.

A question arose as to the renewal of a 2-inch main on the higher portion of a town on the Pacific coast; and in the report on the matter presented by the Manager of the Gas Company to his Directors he stated that about fifty mains, which were india-rubber jointed, had been tested under a pressure of 15-10ths, and that, though they were in a very rusty condition, and broken in several places, all the joints were sound, there being not the slightest sign of a leak in one of them. This report was regarded as highly satisfactory, inasmuch as the 2-inch main referred to must have been one of the first put down when the gas-works were started, and had been laid in a very light, dry soil at an average depth of 2 feet. Most of the pipes were rusted through to quite ½ inch; but the rubber in the joints was as soft and elastic as when it was new.

Our correspondent was able to procure some information on the subject in regard to a neighbouring town, where at least from 70 to 80 per cent. of the mains are jointed with india-rubber rings. After an experience extending over nearly twenty years, they had been found to be far preferable to, and much cheaper than, lead joints, and lasted practically as long as the mains themselves, especially when these were laid in damp or wet ground. Mains which had been in use for more than thirty years had been taken up, and the rings found in perfect preservation. On drawing the joints apart, one half of the ring would usually adhere to the spigot end, while the other half remained in the socket; the body being as fresh and elastic as when it was first fixed. When leaks were discovered in the joints, they generally occurred when the mains had been laid in dry ground and near the surface; thus allowing the air to get at the ring and dry it up, as well as rust the main—the rust gradually forming inside the faucet, and working its way in between the iron and the rubber and in this way causing a leak.

One case occurred where it was necessary to replace a 2-inch main by a larger one, for a distance of about 720 yards; the average depth being about 20 inches, and the ground light and dry. On stripping the mains, an escape was discovered at nearly every joint; and these, on being taken apart, were found to have a coating of rust on the outside and inside of the ring. But whether this was due to the rusty condition of the mains when originally laid or to air getting at the joints, it was impossible to say. This experience, however, was sufficient to deter the Engineer from laying mains with india-rubber joints in ground where there was no moisture. In another place, where a considerable portion of the smaller pipes have been jointed with india-rubber rings, a favourable opportunity occurred recently for overhauling the mains, and there was rarely found a faulty joint when made with a ring, whereas a considerable number of leaks were discovered in the lead joints.

Our correspondent remarked that the experience above recorded entirely corroborated his own. In his case the rings lasted longer than the mains; and there was no perceptible increase in the leakage—from 8 to 9 per cent. being the average. In no instance, so far as his recollection serves, has it been necessary to renew an india-rubber joint.

In connection with the foregoing particulars, it may be mentioned that the mains which supply the suburbs of Paris with gas from the new works at Gennevilliers were laid with india-rubber joints, an illustrated description of which was given in the 'JOURNAL" for the 8th ult. (p. 87).

Scottish Junior Gas Association.—The members of the Western District Section of the Scottish Junior Gas Association visited the Phœnix Tube-Works, Glasgow, belonging to Messrs. Stewarts and Lloyds, Limited, last Saturday afternoon. The works are quite near to Dalmarnock Bridge, at which point the members assembled. They were received at the works by Mr. Marshall, the Manager, and by Messrs. Cross, Dixon, and Gourlay, who became the leaders of four parties which were made up. The machines used in the various processes of making tubes were carefully explained. One of the most interesting portions of the works visited was the small fittings department. The beautiful finish of the solid-drawn tubes was greatly admired. The new producer-gas plant erected by the firm, from the working of which the management anticipate very successful results, came in for much attention on the part of the visitors. Over two hours were profitably spent in the works. The proceedings terminated with a hearty vote of thanks to the management, proposed by Mr. J. M'Leod, the President, and suitably acknowledged by Mr. Marshall, on behalf of the firm.

TESTING FUEL-GAS APPLIANCES.

In the notice of the first annual meeting of the American Gas Institute which appeared in the "JOURNAL" for the 6th of November last, it was mentioned that Mr. Henry L. Doherty presented, on behalf of the Ohio Association (one of the affiliated Associations), an interesting report by a Committee, of which he was the Chairman, on a Standard Method of Testing Fuel-Gas Appliances. The subject was originally brought forward in 1903, when a report was made by the Committee; but they thought it should be amended and replaced by a revised one, which should take the form of a detailed explanation, should be issued as a pamphlet, and be supplied to all gas companies and manufacturers of appliances. The report has been published, and its scope will be gathered from the following extracts from it.

In their preliminary remarks, the Committee point out that until the meeting held in 1903 no attempt had been made to establish standard methods for testing fuel-gas appliances; and they explain that the object of their investigations is to reduce this work to such a condition that the same conclusions will be arrived at irrespective of the circumstances in which it is carried on. They say the field for gaseous fuel is practically unlimited, and the extent to which it is employed depends upon the energy displayed by the managers of gas companies, the price of their commodity, and the efficiency of the appliances available for its utilization. They think it is possible to materially increase this efficiency, and thereby open up more extensive fields for the use of gas than could be done by making a reduction of 25 per cent. in the average selling price. With this explanation, they proceed to give details of the testing methods they recommend—doing so in such a way as to allow of the work being taken up by any ordinary workman, without demanding more than a minimum amount of attention from the engineer or manager.

The first essential in the testing of gas appliances is to have gas of constant calorific value, or a serious error will be introduced at the very outset. The second is that the supply should be at constant pressure; and as 20-10ths is general, the Committee recommend it. They point out, however, that, whatever the pressure employed may be, it should not be variable. As it is seldom possible to get constant pressure unless tests are conducted at the works, it is absolutely essential that a reliable regulator should be used, which should be adjusted to deliver gas at a pressure of 20-10ths. It is equally important that the supply of water, which is used for absorbing the heat of the gas, should be continuous. If the pressure is not constant, the requisite temperature conditions cannot be obtained. A simple and effective method of maintaining a constant head is by means of a flushing-tank furnished with a float-valve, but with the syphon removed. The tank should be placed high up in the testing-room, and a connection made with the service-pipe or other available source, the head of which will always be sufficient to supply the tank at the height at which it is placed. The water for testing is drawn from the bottom of the tank, and the float-valve admits as much water as is taken away, and maintains the head at practically a uniform level.

Passing on to indicate the appliances they purpose dealing with, the Committee state that their report will cover only water-heaters and gas-ranges; and that they will specify methods for determining the extent and division of the losses, and furnish, in regard to some of them, explanations which they think will be calculated to assist experimenters and possibly designers. For the sake of convenience, the following classification is made:—

Water-Heaters.	*Gas-Ranges.*
Circulating	Top burner—
Instantaneous—	(*a*) Regular.
(*a*) Direct.	(*b*) Simmering.
(*b*) Indirect.	(*c*) Giant.
	Oven and boiler.

They explain that circulating water-heaters are of the class ordinarily termed independent heaters, and by preference designated "circulating" heaters by the nature of their operation, which is due to circulation produced by the action of the heater regardless of conditions of pressure. Direct instantaneous water-heaters are those in which the products of combustion come in direct contact with the water; and indirect instantaneous heaters are those in which the heat is transmitted through a metal wall, generally a tube, through which the water flows, and are operated under service pressure conditions. Range-top burners are generally of three sizes—(*a*) the regular, of medium size, of which there are usually three on a range; (*b*) simmering, which is the very small burner, sometimes placed in conjunction with one of larger size, and intended to keep hot a vessel which has been brought to the desired temperature over a larger burner; and (*c*) the giant, which is a burner of larger capacity than the ordinary one, and is intended for heavy or fast work. The range oven is essentially an enclosed chamber, which may be evenly heated to any temperature required for domestic baking. The range boiler, as usually constructed, is also an enclosed chamber, placed either below the oven or elsewhere; and a very high temperature is required for the work it has to do.

CIRCULATING WATER-HEATERS.

With the exception of the direct instantaneous water-heater, the circulating heater, in the opinion of the Committee, is the

most efficient gas appliance now available; but they think it can be materially improved. The efficiency of a heater varies with the rate of circulation through it; and therefore it is important that freedom of circulation should be considered. The Committee set forth the reasons for this, and urge manufacturers to design their heaters so as to ensure free circulation. The losses prevalent in existing water-heaters are attributed to over-ventilation and excessive flue temperature; and it is acknowledged that it is in these two respects that the manufacturers of the best appliances have made the greatest improvements. The Committee do not approve of connecting a water-heater to a flue, unless a broken flue-pipe, similar to that shown in the accompanying diagram (fig. 1), is used; and they recommend that the canopy shown should be placed about 6 feet above the burner, regardless of the length of the heater. Lack of draught in the chimney, without the use of the canopy, may cause the heater to "smother;" while excessive draught will draw in a quantity of air far beyond that which is needed for proper combustion. The excess of air will rob the water of a considerable amount of heat which it would otherwise secure.

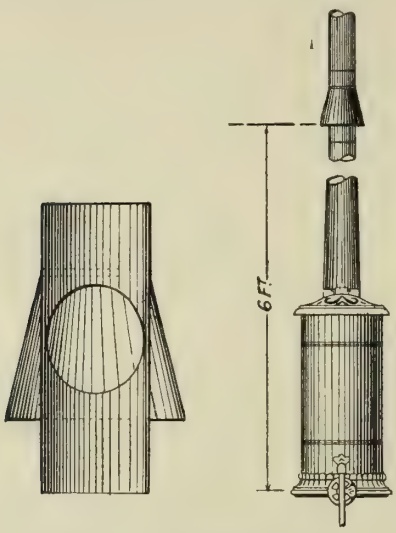


Fig. 1.—Method of Connecting Canopy to Heater.

The Committee direct attention to a point which they consider manufacturers of water-heaters have avoided; or, if they have not done so, they do not appear to have secured the best possible results. Gas as sent out for consumption contains a considerable quantity of hydrogen, which, during combustion, combines with oxygen to form aqueous vapour (H_2O). The heat of combustion of hydrogen is greater than that of any other gas; but unless each pound of aqueous vapour which is formed is condensed before leaving the apparatus, it will carry with it at least 965 B.Th.U. If this moisture or steam were condensed within the apparatus, and the water of condensation removed without its being allowed to fall back upon the heated metal of the interior (in which case it would be re-evaporated), this latent heat might be saved. The flue gases will, of course, pass off saturated; but at a temperature of (say) 180° Fahr. they would contain about 2 per cent. of moisture by weight, while at 212° the amount of vapour carried off might be infinite. Usually, 1 lb. of water would be formed by each 15 to 20 cubic feet of gas consumed, or approximately 1 oz. of water to a cubic foot of gas; while with no over-ventilation and a flue temperature of 180° Fahr., only about 0·0003 lb. of aqueous vapour would be carried off for each cubic foot of gas burnt. It is therefore evident that practically the total latent heat of the aqueous vapour might be saved. Besides the economy, which would be about 60 B.Th.U. saved for each cubic foot of gas consumed, all objectionable moisture would be removed from the room and flue. As the formation of moisture is one of the most objectionable features of water-heaters, this would be a very desirable improvement. Summing up their observations on this matter, the Committee say that the ideal water-heater, in which perfect combustion takes place with little over-ventilation, and from which the products of combustion are expelled at a temperature somewhat below the boiling-point of water, would require no flue, for these appliances are usually placed in large and well-ventilated rooms; and as there would be, in this case, neither moisture nor odour, a small amount of carbonic acid gas would not be a serious objection.

Coming to the testing of circulating water-heaters, the Committee explain that the heater to be tested is connected with a 30-gallon boiler, as shown in fig. 2, by a 1-inch pipe; a thermometer being placed in the horizontal pipes at the top and bottom and valves A and B in each of the vertical sections close to the boiler, and another C in the lower horizontal pipe. The heater is set so that the burner is 4 feet below the top of the boiler, and a flue used extending 6 feet above the burner. The water supply is connected in line with the lower horizontal pipe to the heater, as shown; and it should have a cock F in it, by which the whole system may be shut off. A large cock E is placed on a T-piece at the junction of the lower horizontal pipe and the riser to the heater, by which the whole system may be drained; or by closing the cock C the heater may be drained when a change is made.

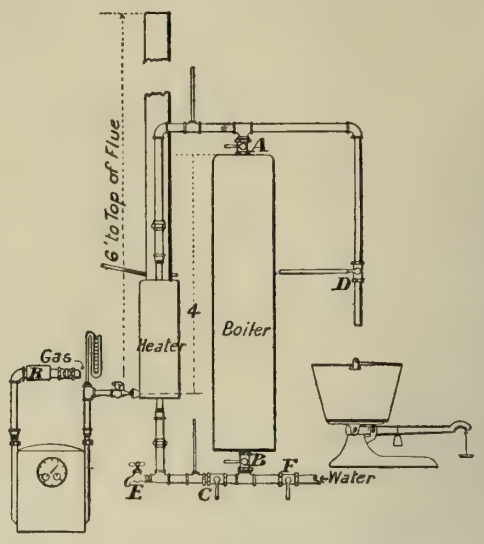


Fig. 2.—Method of Testing Circulating Heaters.

The outlet-pipe is connected in line with the upper horizontal pipe, and then brought down to such a height that the overflow may be conveniently caught in a bucket placed upon scales. At the lower end of the overflow-pipe is a special cock D, capable of accurate adjustment, by which the flow of water may be regulated. This cock is an ordinary lever cock with the slots filed diagonally, so that a very gradual closing or opening may be obtained with the assistance of 18 inches of gas-pipe, which is driven on to the lever after it has been filed to an approximate fit. The gas is measured by a test-meter; and a good regulator R is placed at the back of it to ensure constant pressure.

The first test of a water-heater is to determine its efficiency by natural circulation. This is done by lighting the heater, using the maximum flow of gas, and noting the differential temperature of the thermometers at the end of 10 minutes. The overflow-valve D, only being closed during the test, the valve F must be open. Then open the valve D, and cut the boiler out by closing the valves A and B. Adjust the flow of water by D to such a rate that the same difference of temperature is obtained that was observed at the end of 10 minutes' run. When this is obtained, and has been maintained long enough to show that stationary conditions have been established, weigh off a quantity—say, 20 lbs.—of water; observing the amount of gas used during this time. The weight of this water multiplied by its rise in temperature will give the heat units collected; and the product divided by the total number of units in the gas measured will give the percentage efficiency of the heater under usual working conditions.

As no two kinds of heaters are constructed to use exactly the same quantity of gas, it is desirable to have a test by which they may be compared. This is obtained as follows: The heater is allowed the maximum supply of gas; but the differential temperature is adjusted to 50° Fahr. by the rate of flow of the water, and the efficiency determined as before. Tests are made for each multiple of 5 cubic feet of gas per hour, from the maximum down to 10 feet. By plotting curves of the results as found, an accurate comparison of efficiency and capacity may be obtained. If the actual calorific value of the gas is not known, and cannot readily be determined, an arbitrary value may be assumed, and the results will then be comparative only; but a comparison is all that is necessary for the buyer. Manufactured gas will usually give about 650 B.Th.U. per cubic foot; and this figure may be generally used where the exact calorific value is not known, and great accuracy is not required. Another valuable test to make on circulating water-heaters is to connect them to a tank or tanks from which the water is withdrawn with sufficient rapidity to prevent overheating, in the same manner as in domestic use. Then they should be run for several hours each day—all alike—and monthly determinations made of their efficiency. It will be found that some heaters stop up much sooner than others; and in localities where considerable precipitate is formed, it may be impossible to use certain heaters, even though their efficiency is very high when new.

Instantaneous Water-Heaters.

Direct instantaneous water-heaters, or those in which the products of combustion come in direct contact with the water, must necessarily be operated without back-pressure. This class of heater has the great advantage of a very low thermal capacity, and condensing much of the water vapour formed by combustion, where water somewhat below the boiling-point is being withdrawn; making it possible to obtain much higher efficiency than by the indirect method, and, for the same capacity, with less size and cost than for the indirect heaters. But, on the other hand, there are several disadvantages. The heater must be placed near the point where the water is to be used; it being necessary to regulate the supply at the heater. This is sometimes prohibitive, and if water near the boiling-point is required, there is an excessive loss in the flue; for, as it is impossible for all the water to reach exactly the same temperature when passing through the heater, the temperature of some will exceed the boiling-point, and as it is not confined, will be lost up the flue as steam.

The indirect instantaneous water-heater may have the advantage of being automatic, and of being placed in any convenient location, regardless of where the water is to be used; and it may be adjusted so that water which is almost boiling, and, in fact, even steam, may be obtained. Being under higher pressure, a high temperature can be maintained without formation of steam. Under an absolute pressure of 14·7 lbs., this takes place at a temperature of 212° Fahr. If the pressure named is increased, the boiling-point is raised. This makes it evident that where an indirect heater is used under (say) 60 lbs. gauge pressure, or 74·7 lbs. absolute pressure, the boiling-point is 370° Fahr.; so that the temperature of the water in the heater may be raised above the atmospheric boiling-point without the formation of steam on the interior of the heater. It is apparent that each heater has its advantages, and both classes give excellent results where they are properly applied. Where very hot water is required, or where it is inconvenient to have the heater at the place where the hot water is used, or where hot water is wanted at several places, the indirect heater is superior. But if water somewhat below the boiling-point is to be used, such as for the bath, or washing, &c., much higher efficiency may be expected from the direct heater, with less space occupied and less cost of installation. Both have the very serious disadvantage of an excessive gas demand, and necessitate the installation of an abnormally large service and meter for a consumer whose monthly bills are below the normal.

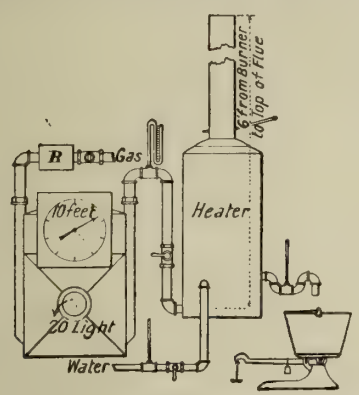


Fig. 3.—Method of Testing Instantaneous Heaters.

The method of testing the water-heaters under consideration is similar in principle to that of testing circulating heaters; the connections being made as shown in fig. 3. As some of these heaters are designed for large gas consumption, a service, meter, and regulator of ample capacity must be used. A 20-light meter, tested for accuracy, may be arranged as shown in the figure, with a large dial calibrated to tenths of a foot, and with the hand attached to the spindle of the 10-feet hand on the original meter dial. A rubber band placed loosely over the spindle and one corner of the large dial, as shown, will take up the back-lash of the train of gears in the meter—making it possible to estimate readings to hundredths of a foot. The water supply is the same as for the circulating heaters. A thermometer is placed in the water supply-pipe near the heater, and a special cock, such as the one used for circulating water-heaters, is employed to control the rate of flow, unless a good valve is supplied by the maker, and attached to the heater. Another thermometer is placed in the outlet-pipe, trapped as shown in the diagram, and the water caught as before and weighed. Heaters having automatic controlling devices should have them cut out or removed during the test. A flue is supplied, the top of which is 6 feet above the burner.

The first test is to determine the efficiency of the heater at the maximum gas consumption, and with the flow of water adjusted so that a 50° rise in temperature is obtained. A similar test is then made for each multiple of 5 cubic feet of gas consumption down to 20 cubic feet, with a 50° rise in the temperature of the water in each case. Then, with the same rates of gas consumption as before, a similar set of tests is made, except that the water is drawn off at a temperature of 120° in each case. By plotting curves of the results obtained from each test, it will be readily apparent, when the requirements of a particular case are known, which heater should be supplied.

Gas-Ranges.

The Committee now take up the second division of their subject; their opening observations being in the nature of a discussion on gas-ranges. They remark that the very large number of these appliances at present in use is sufficient indication that they have generally met with public approval; and there is no doubt that, compared with other methods of cooking, the gas-range has no rival. At the same time, they think that every gas manager will acknowledge that gas is not the most economical fuel. This is the only reason for the gas-range not being adopted by every individual situated where gas can be obtained. It would therefore seem entirely to the interest of gas companies to make the range as economical as possible. There is no doubt that where any gas appliance is used for a variety of purposes, it is difficult to obtain high efficiency for each; and this, the Committee think, is probably the reason for the low efficiency of a gas-range. For instance, though there are three different sizes of burners on the top of a range, under no condition does their efficiency rise much above 50 per cent. The oven is used for numerous purposes, such as the baking of a light cake, requiring a temperature of less than 300°, or a batch of biscuit, requiring 100° more. Then also many people use their ovens for roasting; and where they are employed for this purpose, a still higher temperature is at times desirable. Owing to these various requirements, it would be difficult to make a standard apparatus for determining the actual efficiency of a gas-oven. Consequently, in this case comparative tests which are very simple will be used, and, as far as gas companies are concerned, are quite sufficient. All the heat of the gas, when nothing is removed from the oven, must eventually pass out by the flue or by radiation. If each of these losses is determined, the manufacturer may readily find where an improvement is possible. To determine the relative value of insulating material used to prevent radiation, a very simple and effective method is to place (say) 25 lbs. of loosely coiled copper wire on the lower rack in the oven; then, by lighting the burner, bring the temperature somewhat above 600°. Turn out the fire, close the flue, and take successive readings of the temperature of the oven by a thermometer, the bulb of which is in the interior, and the graduations or stem outside, of the oven, where it may be read. The curve of this fall in temperature, when compared with curves made under similar conditions, but in other ovens or with other insulating material, will readily show which is superior.

In making an oven, the object sought is an enclosed air-space highly and evenly heated. It is apparent that a very thin wall of iron would not keep the temperature of the enclosure as high as a heavy wall of non-conducting material with the same supply of heat; and if an excessively large flue with heavy draught were used, a lower temperature would be obtained than with a flue of just sufficient size and with just the draught necessary to carry off the products of combustion. The Committee ask if there is not room for improvement here.

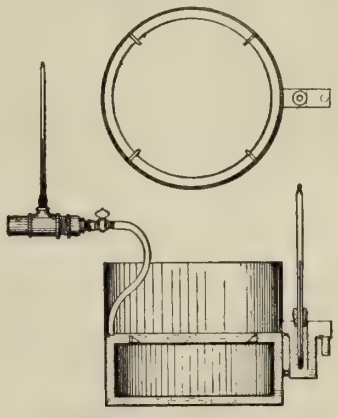


Fig. 4.—Appliance for Testing Top Burners.

The top burners of a gas-range may be tested in two ways. The simpler and less accurate is to evaporate water over the burners. On account of the variation of the boiling-point, due to changes of atmospheric pressure, the impurities in the water, and the fact that much of the work of the top burners is bringing water to the boil, makes it a rather doubtful test of actual efficiency; and tests by this method are usually somewhat below the results obtained in the following manner, which the Committee recommend. The diagram fig. 4 shows a copper pan, 10 inches diameter and 8 inches high, containing a concentric pan which is 3 inches high and 9 inches diameter, hermetically closed top and bottom, and supported from the bottom and sides of the larger pan by slender supports. The purpose of the inner pan is to displace a quantity of water, and thus cut down the thermal capacity of the apparatus. At a point 4 inches from the bottom of the outer pan is an overflow, arranged as shown, in such manner that the water will have to pass through a U-trap containing a thermometer before exit. The overflow opening should be rectangular and 1 inch wide, and the opening for the hose connection should be about $\frac{1}{8}$ inch lower, so that the level of the water in the pan will remain at practically 4 inches. The water is supplied from a constant head of known temperature, and the overflow is caught and weighed. The test is made by allowing a small quantity of water to flow through the pan, and by lighting the burner to the full consumption of gas under a pressure of 20-10ths. Then the flow of water is adjusted so that a rise of 50° in temperature is obtained. When the conditions have become constant, a convenient quantity of water is weighed off, and the amount of gas used while the water is being collected is noted. The heat units collected by the water, divided by the total number in the gas measured, will give the efficiency of the burner under good working conditions.

In testing ovens, to avoid complicated or troublesome methods necessary to determine actual efficiency, a deviation is permitted, and a comparison of the ovens only is made. A stem thermometer, registering to 600° Fahr., is inserted through a hole in the top of the oven to as near the centre as possible. Tests are made, starting with 10 for every multiple of 5 cubic feet, to the maximum flow as follows: The gas is adjusted to the desired rate of flow without being lighted; then shut off by another cock (there is always one at the back of the meter), so that the adjustment

will not be changed, and given time to clear from the appliance. It is then lighted, and readings of temperature are taken each minute, to get the curve of rise until the maximum temperature is reached. A comparison of the results obtained from each oven will readily show which is superior.

The efficiency of a range broiler is determined by the apparatus shown in fig. 5. It consists of a flat closed copper pan, 10 inches

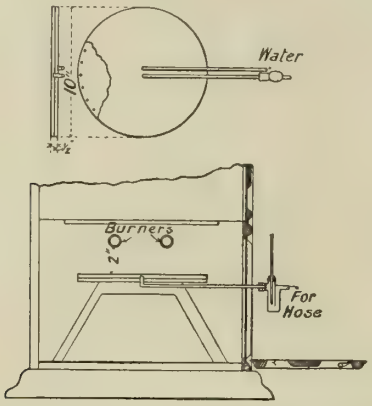


Fig. 5.—Method of Testing Range Broilers.

in diameter and 1 inch thick, closed tightly top and bottom, and with a parting diaphragm of copper half way between the heads, with small perforations near its periphery. The water is supplied from a constant head of known temperature through a ¼-inch brass tube to near the centre of the lower chamber. It will spread, passing to the upper chamber through the holes near the circumference of the parting diaphragm and then to the centre of the upper chamber, from which it is drawn down and out by another ¼-inch tube extending up from below through the lower chamber, and almost touching the upper cover. A slight pressure of water on the inside of the pan will raise the upper cover in the centre sufficiently to allow the necessary amount of water to pass out; and the slight rise in the centre will cause the water from all sides to flow into the centre, provided it is placed perfectly level. The top of the pan should be just 2 inches below the bottom of the flame, and must be central in the broiler. The upper side of the pan must be a dead-black, readily obtained with a coat of lamp-black mixed with spirits of turpentine and laid on evenly. The door of the broiler is left open, and a door of sheet iron made to fit in its place. The door must give the same insulation and ventilation as the original door had. The water supply and return are brought through this door, and the temperature determined at both of these places.

Loss of Heat in Flues.

There is a great difference in the amount of heat lost in the flues of different appliances—the loss in water-heaters being very much less than that of a range; but there is great over-ventilation in all. The method of determining the total loss in the flue and the loss due to over-ventilation are each given in the report; and the Committee think it will be found worth the while of any manufacturer to become familiar with them. Gas companies are not particularly interested in knowing where the losses occur in an appliance; they only wish to know which one gives the highest efficiency. The total loss in the flue consists of the heat carried off by the flue gases due to their increased temperature over that of the room and the service gas, and by the latent heat of the aqueous vapour formed by the combustion of the hydrogen in the gas and its rise in temperature.

In every gas appliance, a certain quantity of air must be admitted to support combustion; and, further, in every case more air is admitted than is theoretically necessary for the purpose. This air enters at the temperature of the room, and leaves at the much higher temperature of the flue. Supposing a case of a rise of 200° Fahr., which is common, every pound of air will carry off about 47·5 B.Th.U. This is the loss due to over-ventilation; and the object is to determine what proportion it is of the total heat which the gas was capable of developing. To make this determination, it is necessary to know what proportion the service gas bore to the sample of flue gas; in other words, how much service gas was burnt during the passage of a given sample of flue gas. Analysis will not show this; but the Committee describe a simple apparatus for making the determination. It consists of a test-meter, a Welsbach burner without a mantle, and a gasholder of several cubic feet capacity. The gas is measured by the meter and burnt in the lamp; the products of combustion being conveyed into the gasholder by suction through a pipe making close connection by a tin cone or funnel with the chimney of the lamp. A suction of about 3 inches is produced in the holder by balance-weights, and is then controlled by a cock in the flue-pipe, so that a natural flame is produced. The exact capacity of the gasholder should be determined by filling it with air drawn through the meter in the same way that the flue gas is taken in, and with the same suction to start with and stop as that used in the experiment—1·5 or 2 inches will be found convenient. The gasholder being filled with flue gas or products of combustion, and its total capacity known, an analysis by an Orsat apparatus is made of a sample of the contents, and the percentage of carbon dioxide determined; and from this is computed the total volume in the holder. The meter will show the quantity of gas used to make this quantity of carbon dioxide, from which the amount formed by the combustion of 1 cubic foot of service gas may be determined. This will not usually vary materially from day to day; so that if accurate results are at once obtained, they may be used till some change occurs in the service gas.

The over-ventilation loss may be found as follows: With an Orsat apparatus the percentages of carbon dioxide and oxygen in the flue gases are determined; and then, for convenience, these figures are assumed to be cubic feet. The carbon dioxide is then divided by the amount found by the experiment to be formed by the combustion of 1 cubic foot of service gas, which will give the number of cubic feet of this gas proportional to a sample of 100 cubic feet of the flue gas; and this quantity multiplied by the calorific value of the service gas will give the total heat supplied during the passage of such a sample. The oxygen found by the analysis is then multiplied by 0·0926 (a constant) and by the difference in temperature between the room and the flue, which will give the total heat carried off by the excess air. The heat lost divided by the total heat supplied will give the percentage of loss due to over-ventilation.

Loss not being considered, the percentage of over-ventilation may be determined as follows: Make an analysis of the flue gas by volume with an Orsat apparatus for CO_2, O, and (by deduction) N. In the proportion N : O :: 79·3 : 20·7, substitute the percentage of N found by the analysis, and solve for O. From this value for oxygen deduct that found by the analysis, which was the free or excess oxygen, and the result will be the oxygen used for combustion. The free oxygen divided by the oxygen used will give the percentage of over-ventilation.

The report concludes with a description of the method of analyzing flue-gases by means of the Orsat apparatus.

The Meaning of the Word "Artesian."

In the course of a paper on the subject of water supply and irrigation recently issued by the United States Geological Survey, Mr. Myron L. Fuller has discussed the significance of the term "artesian." He recalls the fact that it was first applied to flowing wells in the town of Artois, in France; but he points out that no definite meaning can be assigned to it in a scientific publication unless this is specially indicated by the user. Indeed, it is found that the same writer employs it differently in different publications. The predominant scientific usage of the term is for all wells in which the water rises—in other words, for those that exhibit the hydrostatic or artesian principle. In popular practice it is applied, in addition to the uses previously mentioned, to deep wells in general, especially those in rock, and to a certain extent to any drilled wells yielding water of good sanitary quality. After discussing the arguments for these various uses, Mr. Fuller gives the following definitions which were agreed upon by the members of the Division of Hydrology of the Survey as the most expedient at the present time: The "artesian principle" is defined as that in virtue of which water confined in the earth's crust tends to rise to the level of the water surface at the highest point from which pressure is transmitted. "Artesian pressure" is that exhibited by water confined in the earth's crust at a level lower than its static head. "Artesian water" is that portion of the underground water which is under artesian pressure, and will rise if encountered by the well or any other passage affording an outlet. An "artesian system" is a combination of geologic structures—such as basins, planes, joints, faults, &c.—in which waters are confined under artesian pressure. An "artesian basin" is one of porous bedded rock in which, as a result of the synclinal structure, the water is confined under artesian pressure. An "artesian slope" is defined as a monoclinal slope of bedded rocks in which water is confined beneath relatively impervious covers owing to the obstruction of its downward passage by the pinching out of the porous beds, by their change from a pervious to an impervious character, by internal friction, or by dikes or other obstructions. An "artesian area" is an area underlain by water under artesian pressure. An "artesian well" is any well in which water rises under artesian pressure when encountered.

The Council of the Institution of Mechanical Engineers have awarded the Willans Premium to Mr. H. A. Humphrey, for his paper on gas-engines; the selection having been made from among papers read during the last six years. The paper was noticed in the "Journal" for Dec. 18, 1900.

Lecturing to the Scottish Optical Association in Glasgow, on Monday evening last week, Professor Drysdale said he thought there was a great necessity for an unbiassed authority to whom the public might go for information regarding the respective merits of lighting apparatus, and also the measurement of the illumination of streets and halls. Lamps, and especially electric lamps, were not, as a rule, capable of yielding the power they were supposed to give, and generally consumed more energy than they ought to do. To his knowledge, there were at present no authoritative figures by unbiassed persons comparing the respective merits of gas and electric light. This was a field which they, as opticians, might take up.

EXTENSIONS AT THE CHICHESTER GAS-WORKS.

Inspection by the Corporation.

The scheme for the reconstruction of the works of the Chichester Gas Company, to which reference has already been made in the "JOURNAL" (see Jan. 9, 1906, p. 92) as being in progress to the designs and under the direction of the Company's Engineer, Mr. T. Ebenezer Pye, F.C.S., having now practically approached completion, the Directors of the Company invited the Mayor and Corporation to inspect to-day the new works and plant which have been erected and installed, and of some portions of which we give illustration.

The retort-house has only been partially reconstructed; the extension and enlargement proceeding gradually as the increasing consumption of gas may require. In the western section of the house, 10 beds of sixes have been put in. With the exception of those in the two end beds, the retorts are 22 in. by 15 in. ⌂ section. The furnaces most recently put in are of the shallow generator type. The retorts are charged by hand; but it is intended later on to introduce some form of suspended scoop.

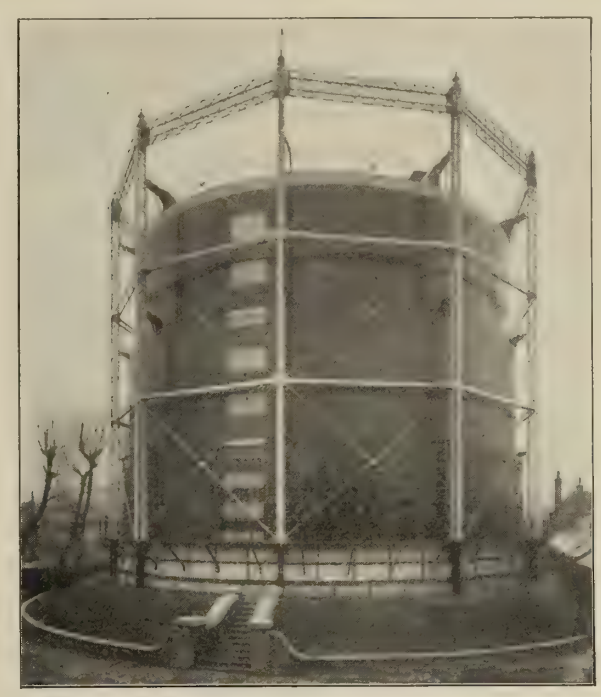
In the exhauster and pump room there is a 25,000 cubic feet per hour combined exhauster and engine by Messrs. G. Waller and Son, one of 15,000 cubic feet per hour by the Bryan Donkin Company, Limited, and a series of pumps for drawing water from a well situate on the Company's property, and for dealing with the liquor in the washer, scrubbers, boiler feed, &c. The boiler-house contains two Cornish boilers, 18 feet long, with Galloway tubes, and working with forced draught (Meldrum furnaces).

The condensing plant consists of a battery of Messrs. Morris and Cutler's well-known water-tube condensers, arranged for duplicating when required. The washer is one of Hunt's, in three tiers, arranged for additional tiers to meet an increased output of gas. The scrubbers are of the ordinary tower type, filled with rough sawn boards on edge. There are three new purifiers, 16 feet by 14 feet, and 5 feet deep, luteless, and fitted with Jäger grids. These purifiers are at present supplemented by those formerly in use as catch-boxes, which it is intended in course of time to replace by two or more luteless purifiers.



The Boiler House.

A new block of buildings has been erected, comprising meter and governor house, with workmen's mess and recreation room above, foreman's office, and meter-testing room, and sulphate works, with stores above. The workmen's room has been much appreciated by the employees, and has doubtless contributed in no small degree to the happy relations existing between the workmen and the management. In addition to the use of the room as a mess-room, the workmen have for the past two seasons been holding pleasant social gatherings on the weekly pay night. The men with their wives and families attend these functions throughout the winter season in full number, and with great regularity. Beyond these buildings is the holder telescoped by Messrs. S. Cutler and Sons in 1905; the work being commenced in September, and the holder converted into a two-lift one before the close of the following month. This piece of smart engineering work was illustrated in the "JOURNAL" already referred to.



The Holder Recently Telescoped.

The meter and governor house contains a 15-inch pressure governor (water loaded) by the Gas-Meter Company, Limited, a cluster of pressure-gauges connected with the various portions of the plant, and a number of the valves controlling the gas-mains to and from the holders. The whole of the work here—including the meter, all the valves, connections, and bye-passes to the meter and governor—was executed to the designs of Mr. Pye by the Gas-Meter Company.

The holder shown was telescoped from a single to a three-lift by Messrs. Cutler last year. The work done including the stripping of the whole of the existing guide-framing and piers, a material strengthening of the tank by wrought-steel bands and stays, stiffening of the outer lift with new additional vertical stays, and the provision of the two new lifts and the whole of the guide-framing. The stanchions are carried down and concreted in at a depth about 2 feet below the bottom of the tank.

The works as now completed are (with the exception of the retort-house, which is under gradual enlargement as required) equal to a production of from 500,000 to 600,000 cubic feet of gas per day. The whole of the building work has been carried out by Messrs. J. O. Holt and Sons, of Chichester; and the retort-house ironwork, foul main, &c., by Messrs. R. & J. Dempster, Limited, of Manchester. The bulk of the engineering constructional work was placed in the hands of Messrs. S. Cutler and Sons; the contracts carried out by this firm including the telescoping and guide-framing of the two holders, the Jäger purifiers, Hunt's washer, the new 25,000 cubic feet exhauster, the underground steel tank for the storage of tar and liquor, the two Cornish boilers, and all the works, connections, valves, &c.





The Exhauster and Governor Rooms.

HATHERSAGE NEW GAS-WORKS.

Reference has already been made in the "JOURNAL" to the new works which have been erected at Hathersage, in Derbyshire, for supplying the town, as well as Bamford and the district with gas. We have just learnt that they were successfully started on the 22nd ult., and that on the following evening the railway station was lighted up, and was much appreciated; and there is every prospect of the Gas Company proving a successful undertaking. The whole of the works, including excavation, foundations, buildings, and apparatus, were entrusted to Messrs. J. Firth Blakeley and Co., of Thornhill, Dewsbury, and were carried out by their own workmen, in accordance with the plans and specification of Mr. Thomas Brown, the Manager of the Matlock Bridge Gas Company, under whose supervision they have been completed.

The works have been erected on the rising ground below the down platform of Hathersage Station; and during the excavations and building considerable difficulty was experienced by the Contractors owing to the influx of water from the hillside, particularly during the wet weather which was general during the latter portion of last year. It was also found necessary, on account of the tendency of the rising ground to slide, to build a strong retaining wall at the back of retort-house, and also to re-arrange the position of the buildings from what was at first designed. The works as completed are shown in the accompanying illustrations.

The retort-house is 29 feet span and 52 feet long, and is built of best local rock-faced wall stone, lined with rubble stone 18 inches thick; and a plinth course is provided 18 inches above the ground level. The roof consists of seven steel trussed principals, with ventilator roof over the top, and is covered throughout with best Welsh slates secured to angle steel slating-laths by lead nails. Two semi-circular doorways are provided at the front side of the house, with galvanized corrugated sliding doors fixed on the inside. The retort-settings consist of two beds of five retorts and one bed of three retorts, 21 in. by 15 in., Ω shaped, and are built on the deep generator system. The subway is covered by means of steel joists and concrete, and is paved with fire-brick for a distance of 4 feet from the bench; the rest of the house being covered with checker blue bricks. One end of the house is being used for the storage of coal; and provision is made for increasing the settings when extensions are required. A vertical steam-boiler is fixed in the house to supply steam for driving the exhauster, pumps, &c. The foul main, 8 inches in diameter,



The Site of the New Works.



The Works as Completed.

is continued partly round the inside of the retort-house; and passes through one of the semicircular windows into the annular condensers, two in number, 24 inches in diameter and 16 feet high, with 8-inch valves and connections forming a complete bye-pass arrangement.

The engine-house is built of rock-faced local stone, and is lined on the inside with brickwork. There is an overhead cast-iron tank, divided into three compartments for tar, liquor, and water. A steam-engine and a three-blade exhauster, of a capacity of 6000 cubic feet per hour, are provided, as well as shafting for driving the pumps. These are fixed in a small building adjoining the engine-house, and are belt-driven; and the connections are so arranged that either tar or liquor can be pumped by one of them, the other pumping only water. The water is supplied from a well sunk at one end of the works, into which is led, by means of 6-inch drain-pipes, the water from a spring at the entrance to the works.

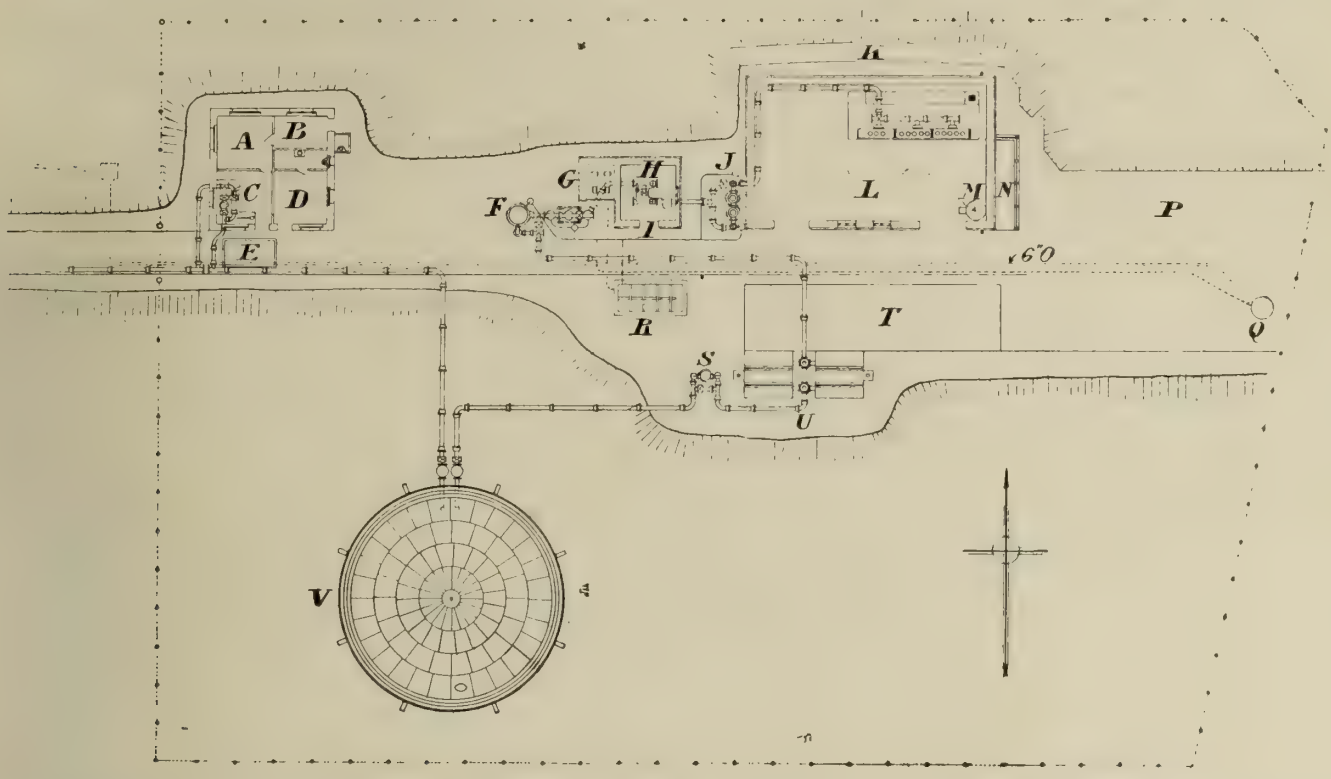
After passing the exhauster, the gas goes through a Cripps patent automatic washer, where the tar and a large portion of the ammonia are extracted. The gas next passes through the tower scrubber, which is 4 feet in diameter and 25 feet high, formed of cast-iron segmental plates with planed joints, and fitted inside with thin wood boards on edge. At the top is provided a water-tank with automatic revolving spreading apparatus, which keeps the wood boards always wet, enabling them to take out the ammonia left after passing the washer. The purifiers consist of two boxes, each 10 feet square, fitted with Green's covers, with apparatus for lifting the covers consisting of a rolled steel joist and travelling pulley-blocks.

After leaving the purifiers, the gas goes through a rotary meter and forward to the gasholder. This is telescopic, the inner lift being 46 feet and the outer one 48 feet in diameter, each 12 feet deep; and the steel tank is 50 feet in diameter, and 12 ft. 6 in. deep. The guide-framing consists of eight lattice standards and girders of substantial and neat design.

The offices and workshops are in one block, built of stone with brick linings. There are four separate rooms—one containing the 8-inch station governor, and also forming a weigh office; another being the general office; and the two back rooms being available for stores and workshop. The roof of the office is of the hipped type, and is entirely covered by slates.

The entrance is from Lead Mills Road, and a roadway about 100 yards long has been constructed along the lower part of the hillside, giving access to the works. The 8-inch mains from the works are under this road, and were fixed by the Contractors up to the gateway. The main laying in the streets has been in the hands of Messrs. H. Gillatt and Sons, of Belper; and the Richmond Gas Stove and Meter Company, Limited, have undertaken the fitting up of meters, cookers, &c.

The Company at present charge 3s. 4d. per 1000 cubic feet to



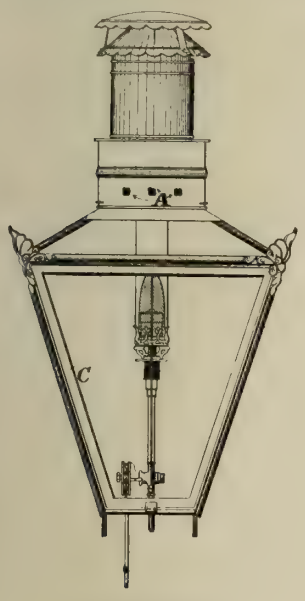
A. Stores and Showroom. B. Workshop. C. Governor. D. Office. E. Weighbridge. F. Scrubber. G. Pumps. H. Exhauster. I. Cripps's Washer. J. Annular Condenser. K. Retaining Wall. L. Retort-House. M. Steam-Boiler. N. Entrance to Subway. O. 6-inch Field Drain. P. Coke Yard. Q. Well. R. Tar and Liquor Well. S. Station Meter. T. Oxide Floor. U. Purifiers. V. Telescopic Holder in Steel Tank.

Plan of the Hathersage New Gas-Works.

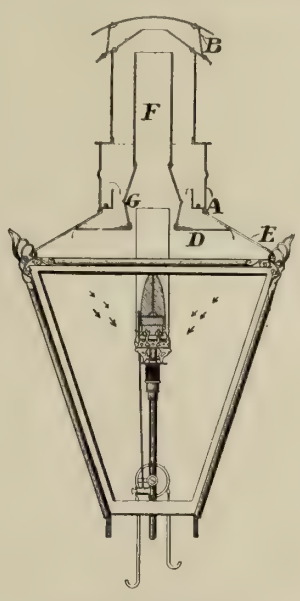
ordinary consumers, and 3s. 9d. to those using prepayment meters; but in the latter case the Company put in the fittings free. A large proportion of the consumers have, we learn, preferred these meters. It is hoped, as soon as practicable, to extend the pipes to Hope and the neighbourhood when there will be about 8 or 10 miles of mains supplying gas to this district. Hathersage is a very popular residential place, especially during the summer months, it being practically a suburb of Sheffield.

NEW LIVERPOOL INCANDESCENT GAS-LAMP.

At the close of the notice of the last annual report of Mr. A. G. Smith, the Superintendent of Street Lighting to the Corporation of Liverpool, which appears elsewhere, it is mentioned that he has designed a single incandescent lamp for use in the public thoroughfares. It is storm-proof, and it is hoped its special construction will help to diminish the obstructions arising from



Front View.



Side View, with Top in Section.

naphthalene deposits, which cause trouble in Liverpool as elsewhere. We give two illustrations of the new lamp, the side view being partly in section. Air enters the lamp by the inlet A, B is the ventilating top, C the cleaning-door, D an enamelled sheet reflector over which the supply of air is obtained for the burner, E an opal glass reflector, F a tube which serves to increase the draught, and G the expansion chamber. Mr. Smith has patented his lamp, the application being dated Dec. 11, 1906; and the Corporation have secured the rights in respect to its use.

HEAT INSULATION OF RETORT-SETTINGS.

A recent number of "Der Gastechniker" contains two short communications on the use of a new insulating material, known as "Thermalite."

According to Herr Braikowich, of Vienna, it is prepared at a temperature of about 1830° Fahr., and consequently is able to resist such high temperatures as ordinarily occur in industrial operations. For jacketting steam-pipes, boilers, &c., it is reported to be highly effective on account of its superior insulating power; to be durable, owing to the method of attachment; and to be very light, since its density is only 0·3. It is made up in shaped blocks, of suitable dimensions for different applications. In the case of pipes, the blocks are in sections, four or six of which exactly fit round the pipe. It is thus only necessary to place them in position about the pipe and secure them by a wire ring. The material is thus far more easily and quickly attached than ordinary insulating materials which are applied layer by layer.

Herr J. Arnold, the Superintendent of the Gaudenzdorf Gas-Works, Vienna, has applied "Thermalite" to hinder the passage of heat from the walls of retort-settings. He introduced into the face of a setting of nine single horizontal retorts, a layer of thermalite, built up of sheets 1¼ inches thick, and over the crown and in the back of the chamber a layer of double the thickness. In the crown, the thermalite layer was laid between the rings of fire-bricks forming the arch and the superposed horizontal courses of bricks. It has been found with this arrangement that the radiation from the face of the setting is greatly reduced, so that both the stokers and the ascension pipes are protected from any excessive heat. There has in consequence been a marked decrease in the number of blocked ascension pipes. The insulation of the arch has the effect of keeping the hydraulic main cooler, so that it fulfils the function of a condenser. Generally, the insulation has resulted in more uniform temperatures being maintained in the retorts. It has not yet been possible to separate the fuel accounts of the insulated settings from those of others; but Herr Arnold hopes shortly to be able to report the consumption of fuel in the furnaces of insulated settings and thus to indicate whether any economy results from the insulation.

O'Connor's "Gas Engineer's Pocket-Book."—We have received from the publishers, Messrs. Crosby Lockwood and Son, the third edition of the above-named work, the text of which has been amended and supplemented by the addition of the statutory regulations for testing the illuminating power and purity of gas, as revised up to August last. We hope to notice the book later on.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1906.

—	Gaslight and Coke.	South Metropolitan.	Commercial.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money (including premium capital)	27,513,757 11 9	8,245,445 0 0	2,598,057 9 7	38,357,260 1 4
Income—viz.:				
Total gas-rental	3,061,930 16 1(a)	1,209,484 14 9(d)	371,591 15 8(f)	4,643,007 6 6
Rental of meters and stoves	75,298 19 7(b)	122,842 11 8	41,648 3 4	239,789 14 7
Residual products	734,766 2 8	487,489 17 8	96,980 18 1	1,319,236 18 5
Miscellaneous, including old materials	24,821 10 8	16,479 15 9	712 17 10	42,014 4 3
Total income from all sources	3,896,817 9 0	1,836,296 19 10	510,933 14 11	6,244,048 3 9
Expenditure—viz.:				
Coal, oil, &c., including carriage and dues	1,206,276 7 6	681,307 7 1	172,889 17 0	2,060,473 11 7
Purifying materials, including labour	62,703 0 1	25,454 19 0	4,013 12 0	92,171 11 1
Salaries and wages—manufacture	259,877 10 1	142,567 4 0	40,864 12 9	443,309 6 10
Wear and tear—manufacture	396,454 6 1	187,593 2 11	51,515 8 10	635,562 17 10
Rents, rates, and taxes	292,545 17 9	87,931 15 2	25,445 14 1	405,923 7 0
Salaries—management	15,437 16 5	6,915 15 6	2,359 11 1	24,713 3 0
Collectors' salaries and commission	45,389 15 11	28,076 0 4	7,187 12 9	80,653 9 0
Stationery, printing, and general charges	20,145 14 6	23,617 1 4	5,415 11 11	49,178 7 9
Directors and auditors	5,900 0 0	5,259 4 0	2,650 0 0	13,809 4 0
Salaries and wages, wear and tear—distribution	253,427 9 5	87,558 0 9	26,566 1 9	367,551 11 11
Repair and renewal of meters and stoves, &c.	137,912 16 2	95,241 8 4	34,019 6 0	267,173 10 6
Law and parliamentary charges	3,405 18 5	3,823 14 7	949 18 4	8,179 11 4
Bad debts and extraordinary expenses	66,252 3 9(c)	62,088 17 4(e)	10,218 4 6(g)	138,559 5 7
Total expenditure on revenue account	2,765,728 16 1	1,437,434 10 4	384,095 11 0	4,587,258 17 5
Gross profit	1,131,088 12 11	398,862 9 6	126,838 3 11	1,656,789 6 4
Do. per cent. on capital and borrowed money	4 2 2	4 16 8	4 17 7	4 6 5
Do. do. gas-rental	36 18 10	32 19 6	34 2 8	35 13 8

(a) Including £138,411 received for public lighting and gas supplied by contract. (b) Stoves only. (c) Including annuities, £47,887 and £2756 on workmen's compensation account. (d) Including £29,689 for public lighting. (e) Including £14,193 paid to pensions, &c., funds, and £43,962 under the co-partnership scheme. (f) Including £11,934 (less discounts and allowances) for public lighting, &c. (g) Including £5933 paid under the profit-sharing scheme.

TABLE *showing the Capital, Income, Expenditure, and Profit per* 1000 *Cubic Feet of Gas Sold in* 1906.

—	Gaslight and Coke.	South Metropolitan.	Commercial.	All the Companies.
	s. d.	s. d.	s. d.	s. d.
Capital and borrowed money	25 6·46	13 5·00	16 7·39	20 9·04
Income—viz.:				
Total gas-rental	2 10·10	1 11·62	2 4·52	2 6·14
Rental of meters and stoves	0·84	2·40	3·20	1·56
Residual products	8·18	9·52	7·44	8·57
Miscellaneous, including old materials	0·28	0·32	0·05	0·27
Total income from all sources	3 7·40	2 11·86	3 3·21	3 4·54
Expenditure—viz.:				
Coal and oil, including carriage and dues	1 1·44	1 1·31	1 1·27	1 1·38
Purifying materials, including labour	0·70	0·49	0·31	0·59
Salaries and wages—manufacture	2·90	2·79	3·14	2·88
Wear and tear—manufacture	4·41	3·66	3·95	4·12
Rents, rates, and taxes	3·26	1·72	1·95	2·64
Salaries—management	0·17	0·13	0·55	0·16
Collectors' salaries and commission	0·51	0·55	0·18	0·52
Stationery, printing, and general charges	0·22	0·46	0·41	0·32
Directors and auditors	0·07	0·11	0·21	0·09
Salaries and wages, wear and tear—distribution	2·82	1·71	2·04	2·39
Repair and renewal of meters and stoves, &c.	1·54	1·86	2·61	1·74
Law and parliamentary charges	0·03	0·07	0·07	0·05
Bad debts and extraordinary expenses	0·74	1·21	0·78	0·90
Total expenditure on revenue account	2 6·81	2 4·07	2 5·47	2 5·78
Gross profit	1 0·59	7·79	9·74	10·76

TABLE *showing the Increase or Decrease in each Item during* 1906 *compared with* 1905.

—	Gaslight and Coke.		South Metropolitan.		Commercial.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£
Capital and borrowed money	..	20,125	100,000	..	35,969	..	115,844	..
Income—viz.:								
Total gas-rental	65,263	..	14,052	..	14,592	..	93,907	..
Rental of meters and stoves	4,415	..	6,226	..	5,824	..	16,466	..
Residual products	22,291	..	4,367	..	5,184	..	31,842	..
Miscellaneous, including old materials	2,770	..	3,603	..	..	130	6,243	..
Total income from all sources	94,739	..	28,248	..	25,470	..	148,458	..
Expenditure—viz.:								
Coal and oil, including carriage and dues	..	3,878	31,532	..	12,513	..	40,166	..
Purifying materials, including labour	..	25,947	..	12,270	..	5,253	..	43,469
Salaries and wages—manufacture	..	29,259	..	1,587	536	..	..	30,310
Wear and tear—manufacture	29,573	..	..	9,504	..	5,818	14,251	..
Rents, rates, and taxes	..	14,789	5,716	..	3,421	..	..	5,652
Salaries—management	78	..	173	..	116	..	367	..
Collectors' salaries and commission	..	3,468	3,111	..	988	..	629	..
Stationery, printing, and general charges	109	..	2,624	..	1,191	..	3,924	..
Directors and auditors	..	29	120	..	..	..	91	..
Salaries and wages, wear and tear—distribution	17,946	..	..	7,721	3,252	..	13,478	..
Repair and renewal of meters and stoves, &c.	9,693	..	2,450	..	4,883	..	17,027	..
Law and parliamentary charges	..	6,560	..	3,727	..	6	..	10,294
Bad debts and extraordinary expenses	3,253	..	2,945	..	..	443	5,756	..
Total expenditure on revenue account	..	23,278	13,862	..	15,380	..	5,964	..
Gross profit	118,017	..	14,386	..	10,090	..	142,494	..

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following Bills have been read the first time: Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Birkenhead Corporation Water Bill, Birmingham Corporation Water Bill, Broadstairs and St. Peter's Urban District Water Bill, Colne Valley Water Bill, Coventry Corporation Water Bill, Devonport Corporation Bill, Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, Heywood and Middleton Water Board Bill, Newquay and District Water Bill, Pontypridd Urban District Council Bill, Portishead District Water Bill, St. Neots Urban District Council Bill, Selsey Water and Gas Bill, Sheffield Corporation Bill, South Lincolnshire Water Bill, Southend Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill, Tees Valley Water (Consolidation) Bill, Tynemouth Corporation (Water) Bill, Wisbech Water Bill.

Petitions have been presented against the following Bills:

Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, by the West Riding County Council, the Audenshaw and Saddleworth Urban District Councils, and the Limehurst Rural District Council.

Birkenhead Corporation Water Bill, by the Chester Corporation, the Liverpool Corporation, the Anglesea, Carnarvon, Denbigh, and Flintshire County Councils, the Connah's Quay Urban District Council, the Neston and Parkgate Urban District Council, the Wirrall Rural District Council, the Connah's Quay Gas and Water Company, the Wirrall Water Company, the West Cheshire Water Company, and others.

Broadstairs and St. Peter's Urban District Water Bill, by the Kent County Council, the Margate and Sandwich Corporations, and the Eastry Rural District Council.

Colne Valley Water Bill, by the Middlesex County Council, the Bushey, Harrow, Hendon, Ruislip-Northwood, Watford, Wealdstone, and Wembley Urban District Councils, and the Hendon Rural District Council.

Coventry Corporation Water Bill, by the Warwickshire County Council and the Meriden Rural District Council.

Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, by the Great Yarmouth Corporation.

Newquay and District Water Bill, by the Newquay Urban District Council.

Portishead District Water Bill, by the Portishead Urban District Council, the Somerset County Council, and the Bristol Corporation.

Selsey Water and Gas Bill, by the Bognor Gaslight and Coke Company, the Chichester Corporation, and Selsey-on-Sea, Limited.

Sheffield Corporation Bill, by the West Riding County Council, the West Riding Rivers Board, the Doncaster Corporation, the Rotherham Corporation, the Stockbridge Urban District Council, the Rotherham Rural District Council, millowners on the Rivers Don and Little Don, and others.

South Lincolnshire Water Bill, by the Bourne Valley Water Company, the Great Northern Railway Company and the Great Northern, Great Eastern, and Midland Railways Joint Committees, the Kesteven County Council, and the Bourne Rural District Council.

Southend Water Bill, by the Southend-on-Sea Corporation, the Conservators of the River Thames, and the Orsett Rural District Council.

Southport, Birkdale, and West Lancashire Water Board Bill, by the Ormskirk, Lathom, and Burscough Urban District Councils.

Tees Valley Water (Consolidation) Bill, by the Easton, Ormesby, and Southbank and Normanby Urban District Councils, and the Stockton Rural District Council.

Tynemouth Corporation (Water) Bill, by the Ashington and Cramlington Urban District Councils, the Bedlingtonshire Urban District Council, the Morpeth Corporation, the Morpeth and Tynemouth Rural District Councils, and the Northumberland County Council.

HOUSE OF COMMONS.

The following Bills have been read a second time and committed: Annfield Plain and District Gas Bill, Brighouse Corporation Bill, Brockenhurst Gas Bill, Bude Gas Bill, Keswick Urban District Council (Water) Bill, King's Norton and Northfield Urban District Council Bill, Kingston-upon-Hull Corporation Bill, Leeds Corporation Bill, Llandrindod Wells Gas Bill, Metropolitan Water Board (Various Powers) Bill, Penrith Urban District Council Bill.

Sales of Shares and Stock.—A few fully-paid original shares (£6 each) in the Skegness Gas Company, Limited, ranking for a maximum dividend of 10 per cent. per annum, were recently sold at £10 10s. each; some ordinary shares of the same nominal value, but ranking for a maximum dividend of 7 per cent., fetching £6 12s., £6 13s., and £6 13s. 6d. apiece. At the Queen's Hotel, Sunderland, last Thursday, Mr. Atkinson Gibson offered for sale by public auction, in accordance with the announcement made in the "JOURNAL," a nominal amount of £30,000 of additional ordinary capital stock (maximum dividend 5 per cent.), authorized to be raised by the Sunderland and South Shields Water Act, 1891. The stock is entitled to dividend from the 1st ult. Bidding commenced at £118 per £100 of stock, and as the auction proceeded prices ranged from £117 10s. down to £115.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Feb. 20.

(*Before Mr. Justice* PARKER.)

In re Kent County Gaslight and Coke Company, Limited—Company to be Wound Up Compulsorily.

This matter came before the Court again to-day.

Mr. BUCKMASTER, K.C., said he appeared for the Company, and the position was this: It was a petition by J. R. Carmona and others for the compulsory winding up of the Company, in consequence of a series of allegations that were made with regard to its promotion. It was quite clear that a very large number of shareholders had already in the Courts obtained relief from contracts to take their shares, on the ground of misrepresentation in the prospectus; and many more were attempting to secure similar relief. The result would appear to be that it was desirable, in the interests of the Company, to have a winding-up order at once, to prevent any further proceedings of this character. During the past week, the petitioners had—a long while out of time—filed four affidavits of a distinctly acrimonious character, which he should certainly desire to answer if they were going to be read. But if, without reading the affidavits, his learned friend who appeared for the petitioners was willing to accept his consent to an order, he was prepared to give it now; otherwise, if the thing went on, he must ask for time to answer the affidavits.

Mr. JESSEL, K.C., for the petitioners, said he did not want to go into matters of controversy; but the affidavits were not out of time, because his Lordship had intimated that evidence might be filed in reply.

Justice PARKER: Mr. Buckmaster is offering you the relief you ask for on the petition; so I do not think you need trouble. The only question is: Are there any other shareholders supporting or opposing the petition?

Mr. JESSEL said there were about sixty, and a large number of them supported the petition. Some who had repudiated preferred to describe themselves as creditors. Everybody who had given notice supported the petition.

Justice PARKER: I think the best plan will be to make the usual compulsory order.

Mr. BUCKMASTER asked that the affidavits might not be read. He said he objected to having, on the face of the order, a series of uncontradicted allegations of this character. If his learned friend insisted on having the affidavits dealt with, he should have to ask for leave to answer them.

Mr. JESSEL said this would not be necessary. After his learned friend's explanation and what he had stated, he did not think anyone would be entitled to say that the order was made on these affidavits.

Mr. BUCKMASTER: You cannot escape from it, because my observations do not appear in the order.

Mr. JESSEL: I do not think my learned friend's clients will be really prejudiced.

Mr. BUCKMASTER said if costs were the only thing in dispute, the Company were willing that the petitioners should have the costs of the affidavits; but the petitioners apparently wanted the affidavits put in the order, so that they might say it was based on their statements.

Mr. JESSEL: I do not think anybody will say so.

Justice PARKER said they need not be mentioned in the order. The other evidence could be read in it, and then in the order for costs the affidavits could be included.

Mr. JESSEL said he was content with this.

Mr. BUCKMASTER assented; and the usual compulsory winding-up order was made, with costs.

Winding Up the Arnside Gas Company.

It is reported that for some time past matters in connection with the Arnside (Westmorland) Gas Company have not been progressing satisfactorily. The works were partly completed, but have for several months been practically at a standstill. The Company was formed in April, 1905; the nominal capital being £5000, divided into 5000 £1 shares. The amount of capital paid up, or credited as being paid up, was £3316; and an application was entered in the Kendal County Court to have the Company wound up. The petitioning creditors were Messrs. Crossfield Bros., of Arnside, who, when the matter came last week before his Honour Judge Steavenson, were represented by Mr. Mansfield. It was said that the amount of the Company's indebtedness to Messrs. Crossfield was £42 11s. The Company were, stated Mr. Mansfield, now insolvent; and, in addition to Messrs. Crossfield, several shareholders and other creditors had given notice in connection with the winding up. His Honour made the necessary order.

South Luton Gas Company, Limited.—We learn that, as the result of legal advice taken by some of the shareholders in this Company, they have been relieved of the shares for which they applied, and the money paid has been refunded to them.

Stockport Corporation Water Supply.—The Stockport Town Council held a meeting on Wednesday for the purpose of considering the revised Kinder Water-Works scheme. It was decided to proceed with the excavation of the remaining portion of the tongue trench, and to make such trial holes for the wing trenches as may be considered necessary by the Engineers (Messrs. Hill and Sons); the cost of the work, which is to be carried out by administration, not to exceed £12,000. The Engineers were instructed to prepare the plans for the earth dam.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Question of Candle Power.

The Half-Yearly Meeting of the Liverpool United Gaslight Company was held at the Offices, Duke Street, last Tuesday, under the presidency of Mr. H. Wade Deacon.

The Chairman, in moving the adoption of the report (which recommended a dividend of 5 per cent. on the ordinary consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock), said he was glad to be able to tell the proprietors that the result of the past half-year's working was quite satisfactory to the Directors. They were now reaping the advantage of the considerable expenditure to which the Company had gone in recent years in improving their apparatus and plant, and they were beginning to see the benefit of the expenditure. He had not the slightest doubt that, as time went on, they would see even greater advantage from it. There had been a small increase in the consumption of gas, which was also satisfactory. The greatest week in this respect was at the end of December—it being the maximum week of the Company for a great many years. It was due to the dark weather and the "cold snap," which came most fortunately for the Company. Further, they had obtained rather better prices for residuals—such as coke and tar. The prospects for the present half year were quite satisfactory; and he thought he was fairly safe in saying that when the accounts were presented at the August meeting, the shareholders would be equally satisfied with the year's working. They were all glad that the trade of the country showed so much improvement, and that prices generally were rising. But still, as Directors, they could not help regretting that, among other things, the price of coal had gone up, because the chief item in the cost of production of gas was the price they were paying for their coal. While the increase did not practically affect them during the present half year, there was no doubt they would have to face some increase in price later. The Directors would, however, watch the matter very carefully; and the proprietors might trust them to exercise their discretion to the best possible advantage and in the interests of the Company. They would, of course, have to pay the price, if they could not get coal any cheaper. Colliery owners for the time being were no doubt going to make their little haul; but the Directors would do their utmost to buy on the most advantageous terms possible.

Mr. J. E. Tinne seconded the motion.

Mr. Steel remarked that the interests of the shareholders were well looked after; and bearing this in mind, he did not suppose that the increase in the price of coal augured any diminution in their dividends. One matter he wished to mention—namely, that, occupying the position they did, they ought to produce gas as cheaply as possible for the benefit of the great community whom they served. He was not sure whether they did so. He referred to their 20-candle power. He had had something to do with a gas undertaking across the water, where they had only 18½-candle power; and the engineer was of opinion that this candle power might be reduced with advantage, in view of the improvements in incandescent mantles, and also in view of the large consumption for heating and power purposes, which would result if the gas was cheaper. He believed that in Manchester the quality of the gas supplied was 15-candle power. Was it not possible that, by being tied to 20-candle power, as they were in Liverpool, they were obliged to charge the community more than they otherwise would have to do? Was it not a fact that 20-candle power gas was somewhat obsolete, in view of the incandescent mantles that could be used? He would ask if it was not well to consider whether they could not reduce the candle power, and in this way reduce the cost of gas, without impairing the efficiency of their service.

The Chairman replied that the Directors always remembered they had not only the interests of the shareholders to consider, but those of the ratepayers. The matter referred to by Mr. Steel had been constantly before them, and had led to an endeavour to reduce the price of gas. For the past eighteen months, they had sold gas at the rate of 2s. 6d. per 1000 cubic feet, which was the lowest price that had ever been charged in Liverpool. The question of candle power was a very important one, and had been considered by the Directors from time to time; and he could assure the proprietors that it would be most carefully gone into again. There was no doubt that with the incandescent mantle a high candle power was not so essential as with the old flat-flame burner; but as far as their experiments had gone, if they wanted a certain amount of light, the best thing was to have a high candle-power gas. On the other hand, if they wanted less light, and at a cheaper price, he had no doubt the proper way to get it was to reduce the candle power. They were quite satisfied that, as far as they had gone, they were doing their best for the citizens of Liverpool with their present arrangements; but if there was any general wish to have a cheaper gas, the Directors would be perfectly prepared to consider the question of giving it a trial, and to ask for the necessary authority to lower their present candle power. But going to Parliament for powers was no joke; and the expense of getting a Bill through, in case there was any opposition, would be considerable.

The report was adopted, and a vote of thanks was accorded to the Chairman.

NEWCASTLE AND GATESHEAD GAS COMPANY.

Record Sale of Gas—Coal Prices.

The Annual General Meeting of this Company was held on Wednesday last, at the Offices—under the presidency of the Chairman, Sir William H. Stephenson.

The Chairman, in moving the adoption of the report and accounts [which were referred to in the "Journal" for the 12th inst., p. 427], said it had been his good fortune on several previous occasions, to move the adoption of the report; but he had never done so with greater satisfaction than he did that day. There were several things which tended to make the report the most complete and the most agreeable that the Company had ever presented. The revenue from all sources for the year 1906 amounted to £381,004. Of this, £255,694 was received from gas, £95,635 from residuals, £27,833 from rental of meters, stoves, and lamps, and £1842 from miscellaneous sources. The expenditure amounted to £278,963, which left £102,041 as the gross profit for the year. Of this sum, interest upon debenture stock and loans absorbed £18,999, and the intermediate dividend paid in August £40,810, leaving £42,232 to pay the second half-year's dividend of £41,570, and carrying forward the surplus upon the year's working of £562, which, added to the amount brought forward from the previous year, left £18,199 to be carried forward to the present year. The result of the year's working was therefore very satisfactory indeed, when it was taken into consideration that the export coke market was not, during the early months, in a satisfactory state. He was pleased to say, however, that during the later months it was very much better, and, what was still more satisfactory, it continued to be better. The abnormally cold weather abroad during the present winter was an important factor in determining the price of exported coke. The prices of sulphate of ammonia, too, had been below those of recent years, owing to the increased production of the article by the introduction of the new process of coke manufacture at the northern collieries, whereby sulphate of ammonia was now recovered from the coal, whereas under the old beehive process it was not. But the market was improving, as the greater demand for the article was absorbing the increased yield. The manurial value of sulphate of ammonia was becoming more appreciated both at home and abroad; and among new markets that of Japan had become one of importance—the exports to that country having increased from 3600 tons in 1903 to over 33,000 tons in 1906. Tar remained practically stationary in value. Perhaps the use of it for road-making would become so universal that its price would improve a little. Only a very slight improvement was necessary to have an appreciable effect upon their revenue; for an increase of $\frac{1}{10}$d. per gallon would yield them over £1000 a year more. The market price of gas coal was at the present time unfavourable to purchasers. The Company's existing contracts had, however, some months to run; and prices might not be so unsatisfactory when the time arrived for purchasing. There was some satisfaction to be derived from the fact that gas coke followed the fortunes of gas coal, especially in the export trade. He saw in the papers that many of the chairmen of gas companies—some of eminent position—did not hesitate to say, in connection with the high price of coals, that the coalowners had formed a ring or combination in order to bolster up the prices. Now, there was no foundation for these statements. Coal was like any other commodity of commerce. The price of coal, whether for gas making or anything else, was dependent upon the demand; and all the talk and all the legislation in the world would never alter this rule of commerce. They were not in a complaining spirit at all on the Board. They had seen the price of coal very much higher; but, over an average of ten or twenty years, it would be found that the Company—no matter what other companies had paid—had only paid a moderate amount for their coal. The quantity of gas sold in 1906 reached the record total of 2960 million cubic feet, an increase of 72½ millions, or 2½ per cent., over the previous year, which, he ventured to say, was extremely satisfactory. The Company at the end of last year supplied gas to 46,664 ordinary and 45,325 prepayment consumers—a total of 91,989. The growth of the Company's prepayment consumers had been phenomenal. The first installation was supplied on Nov. 12, 1900; and the yearly increases had been as follows: 1900, 168; 1901, 4917; 1902, 8203; 1903, 6153; 1904, 7642; 1905, 8707; and 1906, 9535. During the year, the Company's mains had been extended to supply Dinnington Village, Seaton Burn, and Dudley; and they were being extended to supply Annitsford. About three-fifths of the consumers were supplied with cooking-stoves, which had the desired effect of promoting a day consumption. The Act of Parliament which he referred to in his remarks twelve months ago as being then promoted for the removal of certain statutory restrictions as to sulphur, received the Royal Assent on July 20. The Company were now in the same position in respect to sulphur restrictions as practically the whole of the gas undertakings in the kingdom. He took this opportunity of assuring the proprietors and the consumers that the greatest care would continue to be taken by the Directors to maintain the quality of gas supplied to consumers at such a standard as would leave no ground for complaint. The amount of capital expended during the year was £107,213—£14,909 on buildings and machinery at Redheugh and Forth Street, £59,258 on mains and service-pipes, and £33,036 on meters, stoves, &c. The number of public lamps had been increased by 473, which raised the total to 13,582, of which 5833 were fitted with flat-flame and 7749 with incandescent burners. Of the latter, 1775 were of the self-intensifying type. There were two features in the development of the use of gas at the present time to which he would call particular attention. The first was the increased use of high-pressure gas for the lighting of factories and places of business. This system had been extensively introduced in the large factories in the district, where it had given such satisfaction that its employment was being rapidly extended. The other feature was the use of gas in manufactories to provide high heats for melting metals, tempering steel, annealing, and other purposes. They would perhaps be surprised to hear that heats of over 3000° Fahr. could be easily obtained.

The report having been adopted, dividends for the half year were declared at the rates of 4 per cent. per annum on the preference stock and 4⅝ per cent. on the ordinary stock.

An Extraordinary Meeting was subsequently held, at which the Directors were authorized to create £40,000 of new ordinary stock, and £60,000 of new preference stock, both to rank *pari passu* with the present stock of the Company.

Last Tuesday, at the Swansea Police Court, Alfred C. Richards, a collector, was charged with stealing £1 4s. 4d., belonging to the Gas Company. On the application of Mr. Walter Smith, who appeared for the Company, a remand was granted; bail being allowed.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Friday, at the Albion Tavern, Aldersgate Street, E.C.—Sir George Livesey in the chair.

The Secretary (Mr. Charles M. Obren) read the notice calling the meeting; and the Directors' report and accounts were then presented.

The Financial Position.—Correcting a Mistake.

The Chairman said it was his duty to move the adoption of the report and accounts. As usual, the report was as full as the Directors could make it; and, regarding it and the accounts, he thought the proprietors would consider the result of the half-year's working satisfactory. At Midsummer last, the Directors knew there was an increase in the cost of coal; but having obtained their Act, which authorized a reduction of the illuminating power of the gas, the Directors felt it their duty to reduce the price to the consumers by 1d., though they did not expect that, at the price of 2s. 5d., they would quite make both ends meet. The result was there was a deficiency of about £1800 in the half year. But, after paying the dividends, they still had an undivided balance to carry forward, besides which, he would remind the proprietors, they had a very large reserve fund. It now stood at £42,500; and there were very few gas companies, he thought, that in proportion showed a reserve fund so large as theirs. They had also an insurance fund of £15,185; and they hoped to get that up some day to £20,000. But he considered the £42,500 was quite sufficient for a reserve fund. This fund was, at the beginning of the half year, £42,407 odd; and instead of adding the interest as had been the practice hitherto half year by half year, they had, on this occasion, only added £92 odd to make the fund up to the round figure of £42,500, and the balance of the interest had been carried to the revenue account. In the net revenue account would be seen the item "Interest on reserve fund, £459." There was about £1000 a year interest on the reserve fund, which the Directors thought might now be carried to the revenue account, as the reserve fund was quite large enough. As to the question of dividend, he had a mistake to correct. He saw that one or two newspapers had stated that the Company had reduced their dividend. He supposed in these days people had not the time to read carefully what was stated, and thought they had got the sense of what was said when they had not. The paragraph of the report dealing with the dividend said: "With the possibility of a further increase in the price of coal, the Directors do not recommend the payment of the full dividend of 5¾, or £5 13s. 4d. per cent., to which the shareholders are entitled under the sliding-scale when gas is sold at 2s. 5d. per 1000 feet." There the Directors did not say anything about reducing the dividend, but continued: "They have, however, no hesitation in recommending the same dividend as the last—viz., at the rate of 5½ per cent. per annum." The dividend was not reduced; and the Directors had no idea of reducing it. If the price of coal should go up to a greater extent than the Board anticipated, then the proprietors could be assured that, if necessary, the price of gas would be raised. But they could increase the price by 1d. without reducing the dividend at all. A penny increase in the price of gas would give them £5500 a year, which would go some way towards helping them to meet the increased cost of coal.

The Price of Coal.

Now he came to what was really the most important paragraph in the report; and there the Directors made a definite statement: "Reverting to the question of coal, there is a report that a body of Midland gas coal owners agreed, in conference, to put up the price of gas coal 2s. 6d. per ton." This information he might say he had very nearly direct. He had it from a colliery agent who was in communication with the colliery owners. But he had said something on this point at another meeting [*ante*, p. 475]; and it seemed to have excited a certain amount of objection. He did not complain of the coalowners combining. It was the most natural thing they should do so. He did not say the coalowners had formed a ring, or an absolute contract with each other. But they had talked the matter over, and had agreed that they could get an extra 2s. 6d. per ton for gas coal. The northern coal owners met together on Quayside, on 'Change, or wherever they transacted their market business, and talked over matters. And he had been repeatedly told that if a coalowner accepted a price a little under what was supposed to be the rate, he would not like to appear on Quayside. At the time of the last coal boom, in 1900—the coal owners, not in the Newcastle district, who were supplying an important gas company, put their heads together, and agreed to a certain price. The general manager of that gas company, finding this out, gave the go-by to everyone of those coal owners, and went to people outside those who had hitherto supplied the Company for their coal requirements. One did not complain so much of agreements among the coal owners; but what one did complain of was—gas companies being the best and most constant customers for this class of coal—these frequently recurring booms. It was said by a correspondent in a newspaper that these booms were to enable the coalowners to make both ends meet; and the same writer said that, over an average of years, they had only paid 5 per cent., or something like that, which was more than gas shareholders received. He (Sir George) had no doubt the coal owners did not get less than that. But these frequently recurring booms in the price of coal were very unsettling. The first one happened in 1872, and lasted five years before the price went back to its original figure. Then there was another rise in 1890; and that continued three or four years. Then the price went back again. Between 1870 and 1890, the lowest priced coal, free on board, as bought by a London gas company, was 6s. per ton. In 1893, the price went back to 6s. 3d., and in the succeeding years it was at that price and 6s. 4½d., 6s. 6d., and 6s. 9d. Then there came the rise in 1900, and in the last five years they had not returned to the old figures. The lowest price was 7s. 6d.; and he certainly thought 7s. 6d. was a fair price for coal. But before it had time to get back to 6s. 6d. or 6s. 9d. per ton, up it went again, and now they were threatened with another serious advance—which would be very detrimental indeed to the use of gas as a fuel. The increase in the price of coal would also be detrimental, because it would check its use in manufactures. He felt strongly on this point, because cheap fuel was as important as cheap bread to this country. Coal was the capital of the nation; and all industries and trades wanted cheap fuel. But now it was dear. There was no doubt the foreign demand had most materially helped to put up the price. The coalowners were also saying that in the Midlands there had been a difficulty in regard to railway conveyance. Well, this had been overcome. There was no doubt that, when an increased demand arose, and when there was a threatened increase in the cost of coal, the householder was liable to get into something very like a panic. He ordered coal in the fear that it would go higher, and he ordered it in increased quantities. The merchants could not supply the glut of orders; and railway companies could not carry the coal. But from the Company's own experience, the railway companies were meeting this difficulty. Then there was another trouble—that was with the coal miners, who as soon as they found the price of coal was rising, restricted the output. He was told by a coalowner about a week since that when the miners got a 5 per cent. advance, they began to restrict the output, and claimed another 5 per cent., and so on. It was a very serious thing, this constant difficulty between the coalowners and the miners. They seemed to be pulling against one another. He (the Chairman) was once at a meeting at which labour questions were being discussed, and mentioned the circumstance of certain gas companies when they found they could not get sufficient labour at the wages paid, raising the wages voluntarily, and so obtaining all the labour they required. The Secretary of one of the important Unions in the North—an able man, and now a Member of Parliament—hearing this statement, said: "If we had anything like that in the coal trade, we should feel that the millennium was coming." What he (Sir George) understood him to mean was that such a thing never happened as the owners offering an advance of wages; but they went on until they were forced to pay an increase. The two parties were thus continually pulling one against the other. The men, seeing the price of coal going up, restricted the output, and placed all sorts of difficulties in the way, in order to make it go higher, and so get another 5 per cent. But 5 per cent. on their wages did not mean more than 3d. per ton of coal. In the meantime, coal was rising in price. It would, of course, eventually cure itself. It would check trade; and presently coal would come down with a run. But meanwhile a great deal of mischief was being done; and gas companies must resist to the utmost the extraordinary demands that were being made for increased prices. Reverting to the question of the coal miners, when wages increased, working less time. He had heard this repeatedly from coalowners; and statistics showed it to be so. Every increase in wages meant a decrease in production per man. He (Sir George) had once asked a coalowner how this came about; and he said that, ordinarily, a year ago, about 10 per cent. of them stayed away from work. Then, on getting a rise of wages, 20 per cent. absented themselves in December last, and now it was 33 per cent. On an average, they were working 4 days a week, instead of 6. If a man was pressed, he said: "What is the use of my working six days, when I can earn £2 in four days. I am content with that; and therefore I shall not work." This same coalowner also said it was not much use summoning the men, because as one man said: "If you issue a summons against me, I shall leave you to-morrow, and will go to another colliery, where they will allow me to work two days a week if I like." In such cases, increased wages did the men no good. If, when times were good, they got larger wages, and would make use of them to establish their position and become owners of property, things would be altogether different. But it was no use talking about that, because very few employers would take measures to help the men to become property owners. However, the Directors would do the best they could to get coal as cheaply as possible, and to avoid increasing the price of gas. As they had reduced the price whenever they could, the public would, when there was the necessity for an increase, recognise it, and pay without complaint.

Relations with the Local Authorities.

The next paragraph in the report dealt with their relations with the local authorities; and what the Directors were able to state would be regarded as satisfactory. Happily, all the Company's difficulties on the score of parliamentary regulations and restrictions were over. They were now able to manufacture without anxiety or difficulty gas that was satisfactory to their consumers. The companies had induced Parliament to relax the old conditions; and as the Directors said in the report: "They [the new conditions] appear to have given general satisfaction, neither consumers nor local authorities, nor the inhabitants of the neighbourhood of the gas-works, making any complaints of the altered conditions." The Company were supplying gas well above the standard of illuminating power—in fact, more than a candle in excess. The Directors felt they were taking a heavy responsibility in carrying on this contest in Parliament for four succeeding sessions; but they were now able to say the justification of their determination was in the fact that they had got all they wanted, and everything was satisfactory.

Consumers as Shareholders.

There was another satisfactory point in the report. The Company had adopted the principle Parliament had authorized, of offering stock at the market price to the consumers. In September last, the Directors offered to the consumers £30,000 of ordinary 5 per cent. stock at £124 per cent. (which was then the market price); and the whole of the amount had been at once taken up. He did not know whether any of the proprietors read the Engineering Supplement of "The Times." In last Wednesday's issue, there was the best article he had ever read on the question of the relation of Capital to Labour; and his friend the Deputy-Chairman (Mr. Robert Morton) had made the same remark. The article was by Sir Benjamin Brown, who was connected with the second largest engineering establishment on the Tyne. Sir Benjamin said that the greater proportion of the capital of the great undertakings of this country was subscribed by the middle classes, who were not wealthy. That was quite true in the case of the railway companies, for no less than 60 per cent. of the shareholders of railway companies each held less than £500 of stock. Sir Benjamin explained that there were several classes of shareholders; but the best classes of shareholders any company could have were these two: Shareholders among customers, and shareholders

among employees. Mr. Ohren had got out a statement referring to their own shareholders. There were in all 1639 proprietors; and of them 488, or nearly one-third, were consumers, and 449 were employees, so that these two classes were getting on for two-thirds of the total. The consumers and employees were interested in the Company in a double sense; the latter in a treble sense. The consumer was interested as a proprietor as well as a consumer; and the employees were interested as proprietors, consumers, and workpeople. This, he thought, was an exceedingly satisfactory condition of things; and if this practice of inducing consumers and employees to become shareholders in the companies in which they were interested were extended, it would be a great benefit all round. In their own case, through their co-partnership system, they did not now ask their employees of all ranks to do the best they could for the Company. They had got past that; and they now said: "It is your duty and your interest to do the best you can for the Company. You have your savings and property invested in the Company; and you are bound to do your best for it." The men were feeling this; and it was inducing them to take, as the report said, "a real interest as proprietors in the Company, with which no other interest could be compared." What was wanted to check Socialism and do away with many social difficulties—the unemployed, and so on—was to enable workpeople to become property owners. Employers could do a great deal towards this; but employers must take the initiative. If they would do their part, the employees would respond in the right spirit. He was glad to say in their Company they had taken co-partnership as far as they could; and its continued success must depend upon the employees.

CO-PARTNERSHIP HEREAFTER.

He was talking with a statesman—a member of the Government—a few days since on the question of trying to induce other gas companies to adopt the system; and that gentleman said: "You will never get others to adopt it; and so far as your own Company is concerned, it will drop as soon as you are gone." He (Sir George) did not believe it would. If this were his feeling about it, he would not take any more trouble on the subject. He believed it was now established on such a firm footing that it could not be dropped. But this he did recognize, that it would depend entirely upon the employees whether or not it was continuous. As he said, they had carried co-partnership as far as they could—to the participation of the employees in the management. They had with them as Directors that day two of their employees, one a bricklayer and the other a carpenter. There had been a fear that working men would not elect good men for Directors. He was there that day to contradict this. Two better Directors than Mr. Waller and Mr. Wyllie could not have been found in the whole staff of the Company. It was Mr. Waller's turn to retire; and within the last two or three weeks, he stood for re-election. There were a number of men qualified to stand as Directors; but only one ventured to oppose. The voting was perfectly free and fair, being by ballot; and the result was 637 votes for Mr. Waller's re-election and 108 votes for his opponent, or about six to one. This showed two things—that the men appreciated the seriousness of their duty in voting for a representative on the Board. It also showed that, when the men had a good man to represent them, they meant to stick to him. This being so, he thought they could all feel certain this system was thoroughly assured. At any rate, everything depended upon the employees themselves; and he for one was not afraid of their faithfulness to co-partnership in the future.

Mr. CHARLES HUNT seconded the motion.

A SHAREHOLDER'S APPRECIATION.

Mr. JOHN BORASTON remarked that the report then submitted, the details of which had been so clearly explained, possessed the great merits of brevity and simplicity. Its character was such as to confirm that confidence which the shareholders had always entertained in their Directors. At the meeting held in August last, when the reduction in the price of gas of 1d. per 1000 cubic feet was announced, the Chairman, referring to the then recent alteration in the sliding-scale, pointed out that they would be entitled to a dividend of £5 13s. 4d. per cent., instead of £5 10s., as was formerly the case, so long as the reduction continued. But Sir George was very careful to avoid making any promise; for, as he wisely observed, he did not know what was going to happen. Their Chairman had told them that he did anticipate that the growing boom in trade would necessarily lead to an increased consumption of coal, and a consequent advance in price; and they had reason to suppose, also, that the law of averages brought a severe winter into his anticipations. But he had taken them so far into his confidence as to admit that he had no sufficient reason to anticipate that the price of coal would reach its present abnormal height. He (Mr. Boraston) said "abnormal," because, as the Chairman had just pointed out, there was nothing in the growth of home industries, or in the increase of exports, or in the severity of the weather, or in the congestion of coal-trucks on the lines, to account for this increase. Sir George had said that he had reason to believe it might be due to some agreement—he said a fair business agreement—on the part of the coal proprietors. If there was an agreement, it was a somewhat difficult matter for the Board; but it seemed that a greater difficulty was that connected with the limitation of the output by the miners themselves.

The CHAIRMAN: Quite so.

Mr. BORASTON (continuing) said if it was a mere matter of combination, he supposed coal consumers could combine also; but with regard to the other difficulty, it would appear that the only remedy was to be found in the extension of the system of co-partnership which had been so happily introduced in the case of their Company. Whatever considerations were present in the minds of the Directors when the reduction in price was made, he was sure that, as experienced business men, they knew the troubles must be of a temporary nature only, and that the permanent character of the economies in working which had been introduced in consequence of doing away with useless purification and the disuse of lime, justified them in the course they then took. If he might venture to say so, he entirely approved of this reasoning; and he was convinced that the meeting would heartily endorse the action then taken. It was true that they had not succeeded in earning the £5 13s. 4d. per cent. to which they were entitled; but the Directors, in maintaining the dividend of £5 10s., had achieved a result of which they might be proud, and with which the shareholders had every reason to be fully satisfied. For himself—he was speaking merely as an individual shareholder—he was fully satisfied. He recognized with gratitude the devoted care and the business capacity of the Board; and he was proud to be a co-partner in an enterprise which that day stood before the whole world as a pioneer of a plan for the solution of the great problem of the relations of Capital and Labour. They knew quite well that the interests of employer and employed were one and indissoluble; neither could profit at the expense of the other for any length of time. The difficulty hitherto had been to find some scheme which, while being just, would be satisfactory. Sir George had reduced to practice a scheme which appeared before almost Utopian. His plan went further in the direction of true social reform than anything they were likely to get from Parliament. It supplied the best possible incentive—that of personal interest, of the hope of self-advancement—to increased effort on the part of every worker. The money expended annually in connection with this co-partnership scheme was a most valuable investment, and one that brought a return which, if measured in terms of increased efficiency of working, brought a direct pecuniary benefit to every shareholder, whether a working or a sleeping partner; and which, if measured by the higher standard of the relations between man and man, tended to raise employer and employed to a common platform of understanding and goodwill. They had to thank Sir George Livesey for this; but it was, after all, one only of the matters for which they had to thank him. They had also to thank the Directors, officials, and workpeople for the loyal support they had always given him, which had enabled Sir George to present so satisfactory a report that day. The termination of the long parliamentary struggle had been due in part to the efforts of the Beckenham Urban District Council. This Council were fortunate in possessing for their Clerk a gentleman of unusual energy, ability, and force of character. He did not know to what extent this gentleman's advice had been responsible for the result which had been so happily achieved, but he was quite prepared to believe that it was very considerable. But he did know that the amenities of his (Mr. Boraston's) house, which overlooked the works, had been increased by the abolition of lime purification; and he also knew that the gas supply, both for lighting and heating, did not appear to have been in any way deteriorated by the reduction of the candle power. Therefore he judged that Council and Clerk had acted wisely. When referring to the lighting power, he had in mind, not only the domestic supply, but also the lighting of streets and open spaces. There were to be seen near Beckenham Station three kinds of lamps—electric arc, electric incandescent, and gas incandescent. The electric incandescents, however, were not lighted before midnight, when the arc lamps were put out. They were very poor. The arcs gave a very vivid illumination in the immediate neighbourhood of the lamps, but the area was limited and very sharply defined. The gas incandescent lamps gave a clear and well-diffused light which to any ordinary observer appeared to be infinitely better suited for outdoor illumination. Therefore he was inclined to believe that the use of gas for outdoor purposes was by no means at an end.

The CHAIRMAN said he thanked Mr. Boraston for his speech, and especially for the part in which he referred to the employees. He believed their system might be adopted by the railways; but he thought the Railway Boards were afraid to suggest it to the shareholders—fearing that it might possibly reduce dividends for a time by about ¼ per cent. His experience, however, both with their Company and with the South Metropolitan Company, had been that the shareholders were ready to help the workpeople to improve their position. He was also very glad to hear the remarks about the gas—particularly with regard to the incandescent lighting. Here he might say a word for Mr. Shoubridge. Both he and his men took a pride in maintaining the incandescent gas-lamps in as perfect a condition as possible.

The resolution was then carried unanimously.

DIVIDEND.—RE-ELECTIONS.—VOTES OF THANKS.

The DEPUTY-CHAIRMAN (Mr. Robert Morton) proposed the payment of dividends for the half year at the rate of 5 per cent. per annum on the preference stock and of 5½ per cent. on the ordinary stock—less income-tax.

Mr. W. G. WALLER (a Workman-Director), in seconding, said the workmen were thoroughly imbued with the co-partnership spirit, and were conscious of the fact that the Company's prosperity was their prosperity. They had done their duty cheerfully and well.

The CHAIRMAN said that, before putting the resolution, he wished to bear testimony to the good service rendered to the Company by the Clerk to the Beckenham Council. He really helped them to secure a satisfactory settlement, and his Council backed him up. As to the dividend, there was no doubt whatever—unless an earthquake or something of the kind occurred—that they would earn it in the current six months without raising the price of gas. They were safe for the next half year at any rate.

The motion was carried.

Sir J. FORTESCUE FLANNERY, Bart., said they had now reached the resolution of the afternoon. However important might be the adoption of the report and the declaration of the dividend, they were certainly not more so than the re-election to the Board of their old friend the Chairman, which he had to propose. With regard to Sir George's services to the gas industry, he would refer to the latest—namely, the abolition of the sulphur restrictions. Though they might have reached this goal years hence, they certainly would not have reached it for some time but for the special exertions the Chairman put into the agitation This remark applied also to other matters of which he did not propose to speak at any great length. There was one statement in Sir George's opening speech that he could not allow to pass unchallenged. He said that a statesman—a member of the present Cabinet—had prophesied that when he (Sir George) disappeared, the co-partnership system would also disappear. On the contrary, he (Sir Fortescue) believed that every member of the Board would regard himself as personally pledged to carry on the work which the Chairman had initiated, and from what he had seen of the Board of the South Metropolitan Company, he felt sure they would take the same view of it themselves. Above and beyond the mere question of individual support by Sir George's present colleagues, he believed the system had come to stay.

It did not depend now upon individuals. The goodness and soundness of the plan had been well and widely recognized; and the statesman, whoever he was, who made the remark referred to, did not understand the signs of the times. He (the speaker) was fully convinced that he was entirely mistaken in his prophecy. But they hoped Sir George would not drop out for a great many years [Hear, hear], and that they would have the pleasure of re-electing him time after time.

Mr. G. T. Powell, who seconded, said they were exceedingly fortunate in having such a Chairman, and such Directors. Sir George had not only been most successful in getting the work done as it was and making the men co-partners, but he had always been persistent, with English tenacity, in securing the benefits they ought to derive from their gas. He only wished he could have had his way with regard to illuminating power, so that they could have manufactured their gas without any illuminating power at all. Sir George had said often that the mantle answered all necessary purposes of illumination.

The motion was carried unanimously.

The Chairman, in returning thanks, said it was a great pleasure to him to be of use in the business. He had not gone quite so far as to suggest no illuminating power at all for the gas [Laughter]; but they could very nearly get to that with the incandescent mantle. He then proposed the re-election of Mr. Charles Hunt as a Director; remarking that he was an ideal member of the Board.

Mr. H. D. Ellis seconded; and said Mr. Hunt was known everywhere as one of the most eminent gas engineers. Continuing, he remarked that he was entirely in agreement with Sir Fortescue Flannery that the profit-sharing system did not depend on the life of any one man. It would most certainly be continued so long as one thing could be guaranteed—and that was that the men would avail themselves of the opportunity it afforded them. The failure of the men to do this alone could kill it.

The Chairman: You are doing as well in the Commercial Company as we are; the men are becoming shareholders?

Mr. Ellis: Capitally.

The proposition having been agreed to,

Mr. Hunt briefly returned thanks for his re-election; and the retiring Auditor (Mr. Thomas Guyatt) was then re-appointed on the motion of Mr. S. Wood, seconded by Mr. F. W. Brothers.

Mr. Ellis proposed a vote of thanks to the Chairman and Directors; remarking that the management of a gas company did not get any easier year by year, but rather the reverse. There were greater and greater demands every year upon the time, attention, and ability of directors. The ornamental director was "not in it" in these days. They wanted what they had there—thoroughly practical men.

Mr. W. T. Wilkins seconded the resolution, which was carried.

The Chairman returned thanks, and referred with regret to the absence on account of ill-health of Mr. Jabez Light. He then proposed a similar compliment to the officers, staff, and workmen.

Mr. Guyatt seconded this, and it was carried.

Mr. S. Y. Shoubridge, the Engineer, thanked the shareholders on behalf of the workmen and the engineering staff, and Mr. Ohren on behalf of the Secretarial department.

This concluded the proceedings.

CROYDON GAS COMPANY.

For the first time, the proprietors of the Croydon Gas Company met last Friday in the lecture room at their handsome new offices in Katherine Street, Croydon. Before and after the meeting, the offices and show-rooms, and the workshops connected with the distribution department were examined. Over their repleteness in appointment and convenience, much admiration was expressed. The offices now rank among the finest of the many fine buildings in the town; and they will, without doubt, bring good influence to bear upon the Company's business. At the Directors' meeting earlier in the day, the staff presented the Chairman (Mr. Charles Hussey, J.P.) with a large life-like photograph of himself, for preservation in the Board-room. The Chairman has endeared himself to all during his long chairmanship; and the sixtieth anniversary of the Company's formation, and the establishment of the work of the Company in the new headquarters, was considered a fitting opportunity for giving tangible expression to the regard in which the staff hold their Chairman.

At the Meeting of the shareholders, Mr. Hussey presided.

The Secretary (Mr. W. W. Topley) read the notice convening the meeting. The Directors' report and the accounts having been taken as read,

The Chairman moved their adoption. He said it might be of interest, before speaking of the Company's progress in the past half year, if he reminded the proprietors that, at this one-hundred-and-twentieth half-yearly meeting, they were celebrating the sixtieth anniversary of the Company's formation. It was pleasing to the Directors that, on this anniversary, they could congratulate the proprietors on the fact that they now met on their own premises, instead of, as for several years past, at varying and less convenient places. At recent meetings he had referred to the extensions of the offices and show-rooms which had been forced upon the Directors by the growth of the Company's undertaking; and he had said that the new buildings would be found, when completed, to be well adapted to the Company's clerical requirements, and to the convenience and education of consumers. The proprietors would, he hoped, agree with him that these forecasts were justified by the buildings they had now commenced to use, and that the Company's present offices did no discredit to the town that their business was so intimately connected with. In place of cramped, they would now have ample, provision for the needs of the staff, and for the samples they would display of appliances for the many uses of gas to the best advantage. He had no doubt that these improved conditions would be reflected alike in their clerical and advertising work.

THE PROGRESS OF CONSUMPTION.

It would be seen that the sales of gas showed an increase over a year ago of more than 6½ per cent. This increase represented in quantity above 28 million cubic feet in the six months, and compared with an increase in the half year to December, 1905, of 3¾ per cent. He would give in round figures the Company's sales for four periods—each ten years apart—in order that the proprietors might see how steadily and surely had been the progress. In 1876, the Company sold 180 million cubic feet; and in 1886, 340 million. Although in the early nineties the industry began to feel the competition of electric light and of cheap oil for household use, they found that in 1896 the sales had grown to 593 million cubic feet; while in the year just ended they amounted to 1105 millions. In the past half year, during the severe weather which followed Christmas, the largest output recorded in the Company's history for any one day was reached—viz., 5,030,000 cubic feet. It was also interesting, as showing to how large an extent the consumption of gas was in these days of gas-fires affected by the weather, to note that on one cold day last month when the temperature was 16° lower than the corresponding day a year ago, there was an increase of 30 per cent. in the output. The proprietors would have no difficulty in seeing, in face of the possibility of fluctuations in demands so great as this, how imperatively necessary it was nowadays that a gas company should have an ample margin of manufacturing plant beyond immediate average requirements. During the half year they had added to the number of consumers by 1014, and to that of stoves on hire by 789; and they had further sold 247 stoves outright to consumers. If the comparison was made with a year ago, the increase became in consumers 2125, and in stoves on hire 1386.

NEW WORKS AND REPAIRING SHOPS.

The new stove and meter repairing shops at Waddon were complete. They had been in operation some time now; and the results secured were very satisfactory. He should perhaps mention that they would repair there not only stoves and meters, but also the fittings let on hire to prepayment consumers. Large numbers of these fittings passed in and out of the stores; and the Directors hoped to effect an appreciable saving by being able to make as good as new, and use again, fittings that previously would have had to be condemned and sold as old brass. They had for some years past been faced with the difficulty that, during the winter, large stocks of cooking-stoves accumulated in the stores, and that these, owing to the insufficiency of the Company's facilities for storing, cleaning, and repairing them, could not be got ready beforehand for the spring and summer demand. Thus in the past they had either to keep consumers waiting or to purchase new stoves at a considerable sacrifice. The facilities for cleaning and repairing would enable the Company to turn the stoves out equal to new. The new section of washing, scrubbing, and purifying plant at the works was nearing completion; and the larger part of the capital expenditure during the half year had been upon this extension.

INCREASES IN REVENUE EXPENDITURE.

Turning now to the revenue account, there was a very considerable increase under the heading "Repairs and maintenance of works and plant." The expenditure last half year in this direction had indeed been exceptionally great; but it was not of a character that the proprietors need view with apprehension. Much of the increase represented alterations and improvements that would not recur for some time. It would be readily seen that when, in an established works, much enlargement and constructional work was going on, there went with it much adaptation of existing plant to the new conditions; and expenditure of this kind (though much of it had been of the nature of improvement) had been fully debited to the revenue account. The other large increase on the expenditure side was on coal and oil. He told the proprietors in August last that the Board estimated the extra expense, through advancing prices, of these materials at about £6000 for the year 1906-7, but that they hoped, in large measure, to be recouped by an increased return from coke and other residuals. This, it would be seen, had been realized; and in point of fact, while the increase in the output of gas had been upwards of 6½ per cent., the increase in the cost of raw material, after allowing for the improved yield from residuals, had been less than 5 per cent. He was pleased to say this half year promised a similar, if not better, result. There could be very little doubt that when they had to go into the market to buy coal for delivery after June of this year, when their contract expired, they would have to pay prices higher than those at which they bought last spring. While they all regarded it as reasonable that, in times of industrial activity such as this, coal should tend to rise, the Directors believed that the present ideas of the sellers of coal were somewhat inflated, and he thought that, as the year progressed and the cold weather demand (of late very heavy) abated, more reasonable counsels were likely to prevail. Meanwhile the Directors had been able to secure oil enough for their requirements for more than a year to come, at a price not much higher that that of their last contract. Should their expectations as to coal, however, be disappointed, they could take consolation from the fact that, so far as coal was concerned, they could generally count on a rise in expenditure being, in part at all events, offset by an increase in their revenue. This was an incidental economic advantage gas had over its friendly competitor electricity, in whose revenue accounts there was no place for the pleasing heading "Receipts from residuals."

FURTHER CAPITAL REQUIREMENTS.

It would be observed that it had been decided to again raise capital this half year, and that this would be done by an issue, by tender, of "D" stock. It might be, and he knew was by some, thought that, in the past few years, the capital account had grown rather freely; but he thought a little consideration of the growth of the undertaking side by side with the growth of capital account would re-assure any who felt nervous on this score. It was a truism that at times wise expenditure was the best economy. He had, on several previous occasions, pointed out that the fairest test of the administration of a gas undertaking from this point of view was furnished by seeing how much out of the price at

which gas was sold had been taken for the use of the money employed in the business. He would once more apply this test to their Company. In 1876, the toll levied by capital on the price of gas was 1s. 5d. per 1000 cubic feet; in 1886, it was 1s. 3d.; in 1896, 1s.; and last year, only 10d. He trusted these figures would convince every proprietor that the Directors were not spending capital faster than was absolutely necessary in view of the growth of the business.

The DEPUTY-CHAIRMAN (Mr. T. Rigby), in seconding the motion, remarked that the Chairman had dwelt upon the consumption of gas that had been going on during the past half year; and it would be agreed that it was very satisfactory. When he (Mr. Rigby) said there were upwards of 2500 houses now empty in Croydon, it would also be agreed that when these houses were filled there would be a still larger gas consumption.

Replying to an inquiry, the CHAIRMAN stated that a larger quantity of gas had been manufactured at a less cost. This was due to the bringing of the new machinery into use, and to much better carbonizing results.

The motion was carried.

THE COST OF CAPITAL.

Mr. CORBET WOODALL moved the declaration of dividends at the rates per annum of 14½ per cent. on the "A" stock, 11½ per cent. on the "B" stock, 10¾ per cent. on the "C" stock, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock, all less income-tax. He said one could not help feeling, meeting in their new offices, that they had reached a period in the history of the Company that called for such a review as the Chairman had given of the history of the concern. He had no doubt whatever that the feeling in the minds of many proprietors was that the new block of buildings, the great block they had built at Waddon for dealing with stoves, meters, and so forth, and the great extensions of the works, had together meant a very large expenditure of capital, and it might cause some qualms as to the future. He thought the Chairman fully dealt with this by pointing out how the charge for capital had been a constantly reducing quantity. He (Mr. Woodall) had asked Mr. Helps to give him a statement of the capital in relation to the business during the period of 20 years. Taking 1881, the capital per 1000 cubic feet of gas sold was 15s. 8d.; and in 1890, it had fallen to 10s. 6d. This was a reduction of about 50 per cent. In that year, they bought the Carshalton works, with the result that the capital went up to 11s. 10d. It fell again to 10s. 3d. (which was less than the amount in 1890) in 1904. Then they bought the Caterham works; and in this case, as in the case of Carshalton, what was bought was not simply the gas-works but the goodwill of a prosperous business. This put the rate of capital up from 10s. 3d. to 11s. 6d. That was last year; and this year they were down again to 10s. 10d. He had no doubt that in a couple of years, they would be as low as, if not lower than, they had ever been before. He thought it was very encouraging to know that, however rapidly they were spending capital, they were only spending it for productive work; and, this being so, the more they spent the better. [Mr. Woodall then illustrated the necessity for the expenditure of the money on the extension of the offices and shops by quoting figures as to the number of stoves and meters handled.] Both in capital expenditure, and in the work of fixing, maintaining, and repairing meters, stoves, and fittings, the charges upon the Company were now very heavy. They were kept up to the highest level of the knowledge of the day by their Engineer; and their works were in most thorough order. By not allowing the fear of reducing the net revenue or profit to interfere with the full maintenance of the undertaking in the highest state of efficiency, not only did they maintain their position, but they increased their business largely, and the tendency of the price was downward.

Mr. W. CASH seconded the motion; remarking that, although the dividends might sound high, it must not be forgotten that they had (excluding premiums on loan capital) close upon £120,000 premium capital on which no dividend was paid.

Moved by Mr. PERCY H. HALL, and seconded by Mr. A. W. OKE, Mr. Hussey was re-elected to his seat at the Board; and Mr. Samuel Spencer was also returned, on the motion of the DEPUTY-CHAIRMAN, seconded by Mr. COLMAN.

The retiring Auditor (Mr. J. Jones) was also re-appointed.

Before separating, the proprietors passed hearty votes of thanks to the Chairman and Directors and to Mr. Helps and Mr. Topley. Many kind and well-deserved things were said as to the work of the Board and the chief officials; and recognition was also particularly made of the work of the Assistant Engineer (Mr. Caddick), the Distributing Superintendent (Mr. Sandeman), the Assistant Secretary (Mr. Anderson), and the Rental Superintendent (Mr. Haines). The clerical staff and workmen were also praised for their diligence and loyalty. Referring to the question of the large extra quantity of gas made at a reduced cost, and to the statement of the Chairman that this was largely due to the use of machinery, Mr. Helps said he should like to add that the intelligent use of the machinery by the men had also done much for them. Many of the workmen were shareholders, and he saw some present at the meeting. They would, he was sure, convey to their comrades the appreciation of the proprietors. An acknowledgment by Mr. Topley concluded the proceedings.

The West Riding Rivers Board and the Sheffield Corporation Bill.—At a recent meeting of the above-named Board, the Bill promoted by the Sheffield Corporation to obtain further powers in respect of their water undertaking was under consideration. It was resolved that unless the Corporation agreed to amend the Bill in regard to compensation water, the Clerk and the Solicitor should act on the previous instructions of the Board to oppose, and that the West Riding County Council should be invited to co-operate with the Board so as to secure a continuous discharge of compensation water during each day of 24 hours. It was urged that the primary duty of the Board was to purify the rivers, and to leave the Corporations to deal with the water-works schemes. It was stated on the part of Sheffield that there was no likelihood of the Corporation coming to an amicable arrangement with the Board, so that the matter would probably have to be fought out before a Parliamentary Committee.

TOTTENHAM AND EDMONTON GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held on Saturday at the Offices, No. 639, High Road, Tottenham—Mr. CORBET WOODALL in the chair.

The SECRETARY (Mr. E. Topley) read the notice calling the meeting; and the report and accounts were taken as read.

FURTHER REDUCTION IN THE PRICE OF GAS.

The CHAIRMAN, in moving the adoption of the report and accounts, said the record of the half-year's work had again proved satisfactory. They were now practically at the end of the winter season; and he was able to say that the supply had been maintained in a perfectly satisfactory manner over the whole of the Company's very wide area. The price charged during the half year had been less than in 1905 by 2d. per 1000 cubic feet, which meant a difference in revenue of about £5000. It had again been found that the amount so surrendered to the consumers had been more than returned to the Company in the form of increased consumption. Although a greater demand did not invariably follow upon a reduction in price, yet there was no doubt it was stimulated thereby, and especially by the feeling engendered among consumers that the tendency of the charge for gas was steadily downwards. He was exceedingly glad to intimate that day a further reduction in price. This was the third time within four years it had been his pleasure to make such an announcement. From Christmas, the price charged to ordinary consumers had been 2s. 6d. per 1000 cubic feet, with discounts varying with the quantity consumed, and also in the case of gas used for power. As the proprietors were fully aware, seeing he had had to refer to it so often, the Directors had had to expend large sums year by year in the renewal and reconstruction of works. These would be less burdensome in the immediate future, and for this reason, as well as because of improvements in manufacture, though they knew some charges would be heavier after midsummer, they had made the reduction without fear.

THE RELATION OF CAPITAL TO BUSINESS.

The capital expended in the half year amounted to £26,370, of which £11,611 was for additional land. The land in question was that of which the Act of last year authorized the purchase. As soon as the resolution was (taken early in 1905) to proceed with the application to Parliament for further capital and other powers, the Directors instructed an agent to purchase the lands required, including Willoughby Farm. At the same time, pending the passing of the new Act, they had no right, as a Company, to hold the lands; and therefore the necessity for their purchase by the Directors personally, and their subsequent transfer to the Company. This (as the report had announced) had now been fully accomplished. The relation of capital to business done—notwithstanding the large expenditures, and the outlay during the year of upwards of £11,000 on land, which was at present unproductive—continued very satisfactory; and the charge per 1000 cubic feet sold for dividend and interest was less that day, he believed, than it had ever been in the history of the Company. Going back some fifteen years, the amount then paid in dividend and interest, although at a lower rate per cent., represented 10½d. per 1000 cubic feet upon the gas sold; to-day, he was glad to say, it was 6·27d.

POINTS IN WORKING AND GENERAL PROCEEDINGS.

The proprietors would have seen from the report that there had been an increase of nearly 10 per cent. in the quantity of gas sold in the half year, as compared with the corresponding period of 1905. This increase had been supplied chiefly through prepayment meters, of which there were now in use in the district 27,035. The new retort-house (which the shareholders had the opportunity of inspecting on the occasion of their visit to the works in the autumn of last year) had been in operation during the year, and had been the occasion of considerable saving in working expenses. The price of coke had been good; and in order to have more for sale at the better price, they had made less carburetted water gas. This adaptability to circumstances was not the least of the attractions of carburetted water gas. Putting together the costs of coal and oil, and deducting receipts for residuals, there was a reduction in the net cost of materials of £1400, although the price per ton of coal was higher, and the quantity of gas sold had been greater by 55 million cubic feet. He thought this was very strong testimony to the way the operations had been conducted at the works. The expenditure upon repairs and renewals had again been very heavy; but, as he had already said, the works of reconstruction were now, for the present, practically completed. Another special and somewhat heavy item of expenditure, which they hoped would not recur for some time, was that of parliamentary charges. They obtained in their Act of last year an ample return for the labour and cost expended in procuring it. The opposition to the London Outer Circle Railway was another matter. The Directors were not opposed to the scheme of the railway on principle. Indeed it was to the Company's interests the scheme should be carried out. They were obliged, however, to press for certain works on approach roads, so that their lands should not be isolated; and these were only settled on the eve of the defeat of the Bill. He was pleased to say the Company's relations with the Local Councils and the consumers were friendly. Everything was done by their officers and workmen to ensure the best service possible, both to the private consumer and to the public lighting. They had now discontinued making any charge for the time of the men employed in attending to the consumers' burners, mantles, and fittings; the only charge made being for materials actually supplied. An event of great interest in the story of the Company which occurred at the close of the half year, was the retirement of Mr. Randall from the position of Secretary. This would be the occasion of a special resolution later, so he (the Chairman) would make no further reference to it here, nor yet to the selection of his successor. The works were now in excellent order; and the Directors would probably invite the shareholders to hold their autumn meeting there again this year. A special purchase of land had been

made to the north-west of their property, giving access to Angel Road and the district thereabouts.

THE COAL QUESTION—THE REGULATION OF PRICES.

He had already said that their expenses after midsummer would be increased. There was no doubt they would have to pay more for coal when their present contracts expired, though they had purchased a portion of the supply for 1907-8 at the price current six months ago. He thought the present position of affairs with regard to the coal supply was deplorable. Trade was good, and the demand for coal consequently large. These were conditions which ensured a reasonably high price. But this was the time chosen by Parliament to take off a duty on exported coal which was yielding a handsome revenue, and causing no inconvenience to, nor imposing any burden upon, any class of the community. The removal of the duty had stimulated export; and this, added to the good trade, had caused the demand to equal, if not exceed, the supply, and so put the question of price largely into the hands of the coalowners for determination. It was not to be wondered at if the temptation to make vast profits was irresistible to men who said they had for years past been doing no more than earning the money to pay wages. In his opinion, the question of coal supply was so grave, the injury to the country and its industries so great when cost became extravagant, that some means should be found to govern prices, and prevent these harmful fluctuations, which alternately caused owners and users to thirst for opportunity for retaliation. As he had said elsewhere, these famine prices brought their own cure; but only at the cost of incalculable loss and great suffering to numbers of people. He knew how difficult it would be to find means and authority to regulate prices. Conceive, however—as an extravagant illustration—a combination of owners to close down pits representing half the output. No machinery existed, he believed, to prevent such a catastrophe. The country could not stand such a crippling of its resources; and would not means be promptly found to recover for the nation the use of what was essential to its life? If this great necessity of the nation was to be in the hands of individual owners, they should be subjected to regulation and control, as was the industry with which their own Company was associated. Prices yielding a fair return to the vendors would be found, on the average of years, more advantageous than one year of immense profit, followed by many years of leanness and of comparative poverty. If it had been found possible to regulate equitably the charges for gas, water, and electricity (which might be called municipal necessities), it should not pass the wit of man to find means to regulate also the price of coal, which was of national and far greater importance. Meanwhile, they must do the best they could. Their action in reducing the charge for gas showed the conviction of the Directors that the high price would soon wear itself out; and while it lasted, gas would displace coal for heating their houses at a rate greater even than in the immediate past.

ELECTRICITY COMPETITION.

Tottenham and Edmonton would very shortly be furnished with a supply of electricity. The competition would probably affect their rate of growth for some little time; but he had no fear whatever as to its interfering with the prosperous career of the Company. They were now established so firmly, and their finances were in so healthy a state, that there were few undertakings, if any, better equipped to face what the future might have in store.

Mr. H. BAILEY seconded the motion, which was carried.

Mr. D. FORD GODDARD, M.P., moved the declaration of dividends at the rates per annum of 6½ per cent. on the "A" consolidated stock, and 5 per cent. per annum on the "B" consolidated stock, both less income-tax.

Mr. G. T. WATSON seconded; and the motion was agreed to.

MR. RANDALL'S RETIREMENT FROM THE SECRETARYSHIP, AND ELECTION TO THE BOARD.

Mr. HASLAM then proposed—"That pursuant to section 54 of the Tottenham and Edmonton Gas Act, 1906, the number of Directors of the Company be increased from five to six, and that the allowance to the Directors be increased accordingly to the sum of £1800 per annum dating from Jan. 1, 1907." Speaking in support of the resolution, Mr. Haslam referred, in many happy phrases, to Mr. Randall's long service to the Company. Among other appropriate passages were these: He said he had known Mr. Randall for over forty years. During the whole of that time, he had found him to be a man of extraordinary wisdom, and of a wide measure of integrity; and, as a worker, he did not know his equal. Mr. Randall had now the satisfaction of finding his labour of 54 years for the Company represented in the resolution he had the privilege to propose.

Mr. ASHMOLE seconded the proposition. He alluded to the great growth of the business of the Company; and expressed the opinion that six Directors was not one too many. He was glad they had this opportunity of retaining the mature experience of Mr. Randall to bear upon the work of the Company.

The motion was unanimously carried.

The CHAIRMAN then moved—"That the action of the Directors in inviting Mr. James Randall to join the Board be approved, that he be, and is hereby, elected a Director of the Company, and that an annuity of £350 per annum be paid to him on his retirement from the office of Secretary." In the course of his remarks, the Chairman stated that during the many years he had been associated with Mr. Randall, he had always found him not simply an admirable officer of the Company, but also a loyal friend and helper. It was a great testimony to any man to have lived in a conspicuous position in the district where he was known necessarily to a large number of the inhabitants, and at the end of that time to find himself held in the esteem and repute in which their friend was held that day. He (the Chairman) desired it to be understood that the retiring allowance now proposed only referred to the period during which Mr. Randall held a seat on the Board. Should he at any time resign the seat, the amount of the retiring pension would be reconsidered. As to Mr. Ashmole's remarks, it must not be taken that the Board would always remain at six. He himself considered a small and efficient Board was preferable to a large one.

Mr. SAVORY, who is the Chairman of the Electricity Committee of one of the authorities in whose district the Company supply gas, seconded the motion, and alluded in eulogistic terms to Mr. Randall's work. He hoped their friend would be spared for many years to enjoy the position he now held on the Board.

Dr. BENJAFIELD added his testimony; and, in a speech of some length, proposed that the retiring pension be £450.

The motion having been seconded,

The CHAIRMAN expressed his regret that the amendment had been proposed. It came to the Directors as a surprise. If anyone supposed that any proprietor of the Company felt towards Mr. Randall a stronger sense of loyalty and kindliness than the members of the Board, he was sure that proprietor was mistaken. The Board had given this matter the gravest consideration; and they had settled terms that were entirely acceptable and pleasing to Mr. Randall. That there should have been introduced into the meeting one word to disturb what he (the Chairman) had hoped would be one of the pleasantest episodes in the history of the Company was to him personally a matter of the greatest regret.

The amendment only received some half-a-dozen votes; and the original resolution was then carried without a dissentient hand being shown.

Mr. RANDALL (who was enthusiastically received) said his words on that occasion would have to be few. He thanked all present most sincerely; and he might say that what had been proposed by the Chairman he accepted cheerfully and with the greatest pleasure. He hoped he might be long spared to serve the Company in the capacity which he had the honour now to fill. Looking back to the period when he first entered the service of the Company in 1851, the population of Tottenham was then only 9120; to-day it was 130,444. In those days of long ago, he used to inspect the meters and collect the rental; and there were also many houses supplied with gas, without meters, but simply through a cockspur—charge being made at so much per hour. Of course, a great amount of reliance was placed upon the honesty of the consumers who paid by the hour. The price of gas was then 7s. per 1000 cubic feet; it was now 2s. 6d. It must be remembered that the successes of the Company—everyone of them—had been brought about by the economies of former years; and the present Chairman and Board were following the same policy of keeping the capital down.

Mr. D. FORD GODDARD then proposed that the remuneration of the Secretary (Mr. E. Topley) be £450. He believed, from the experience they had already gained of Mr. Topley, that he would make a very efficient Secretary.

Mr. W. B. RANDALL seconded the proposition; and it was unanimously passed.

Mr. TOPLEY having responded,

A hearty vote of thanks was passed to the Chairman and Directors, on the proposal of Mr. BAKER, seconded by Dr. BENJAFIELD.

The CHAIRMAN having responded, proposed a vote of thanks to the Engineer and Secretary, and their respective staffs.

Acknowledgment was made by Mr. BROADBERRY and Mr. TOPLEY.

CREATION OF FURTHER CAPITAL.

On the proposition of the CHAIRMAN, seconded by Mr. BAILEY, the Directors were authorized to create and issue as required, additional "A" and "B" consolidated stocks or new preference stock to the amount of £200,000, and also to borrow, by the creation and issue of 4 per cent. debenture stock, sums not exceeding in the whole £60,000. In the course of a few remarks, it was pointed out by Mr. H. D. ELLIS that, whereas the capital was equal to 9s. 8¾d. per 1000 cubic feet six months ago, it was now down to the low figure of 9s. 4¾d.

The meeting then ended.

BROMLEY GAS CONSUMERS' COMPANY.

Fluctuations of Increased Consumption—New Plant—Position of the Gas Coal Market.

The Half-Yearly Meeting of this Company was held last Tuesday, at the Bell Hotel, Bromley, Kent—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the Directors met the shareholders on this occasion with further reassuring features of the Company's progress. The increase in the make of gas for the half year was 4½ million cubic feet; and this, added to the increase of 7½ millions the previous half year, gave an increase of 12 millions for the year. That was a very satisfactory figure. The fluctuations in consumption might truly be said to be as fitful as the weather. Those of the half year were very interesting and instructive; and he would just refer to them briefly. For instance, in the first three months of that period, they had no less than 3 million cubic feet increase in the make of gas. Up to Michaelmas, the duration of sunshine, as the shareholders would remember, was more prolonged than usual. The temperature generally was that of an unusually warm summer. Gas was not then apparently required to any great extent for lighting or heating. The inference appeared to be that the facilities for cooking by gas in hot weather were now becoming more generally known and appreciated, and that, as cooking-stoves were popularized in the future, he thought they might confidently look forward to an increased summer business. Then in October and November, the consumption fell off somewhat through the absence of any marked periods of cold or fog, in which the use of gas for both lighting and heating would have been greater. But so soon as real winter came upon them with Christmas, the daily increases at once became very substantial, proving that for lighting, heating, and cooking the Company's field of supply would be as expansive as heretofore when favourable conditions prevailed. He thought this was a very reasonable conclusion from that retrospect of the

variations of the consumption during the half year; and this experience, he was pleased to say, had also characterized the supply in the past six weeks. The Company had given the greater use of gas every possible encouragement—first, by continuing the reduction in price made in Michaelmas, 1905, although the cost of manufacture had increased and the revenue from residuals had slightly diminished. At such a time, all possible economies in manufacture needed to be applied, and that they were endeavouring to realize them would be evidenced to the shareholders by the improvements that had been effected at the works. Formerly the coal was taken from the railway trucks, wheeled to the retort-house, the retorts were charged, the coke was raked out into barrows, wheeled to the yard and quenched, and then shot, stacked, and loaded—all by hand labour. Now the coal when it left the railway trucks was elevated, conveyed, and delivered into the retort-house by machinery, the retorts were also charged mechanically, and the hot coke pushed out by machinery; and then the coke was dealt with by their latest new plant. It fell on to a conveyor, provided with self-acting water-jets for cooling it as it passed along; the conveyor carrying it to bunkers in the yard, whence, as required, it was lifted by a rotary overhead steam-crane, either for treatment by mechanical breaker, for stacking or loading into carts, or for depositing directly into railway waggons on the Company's own siding for distant deliveries. The crane, which worked on a circular gantry, spread its reach practically over the whole space of the yard where the coke was handled, stacked, or loaded. The addition of this new plant would, under an original scheme, have constituted a capital outlay; but in the circumstances of to-day, the Board and their Engineer had thought it in the best interests of the Company to defray half the cost out of revenue. They had, therefore, charged half against the balance of undivided profit; and the other half had naturally gone to capital. But instead of the Company being able to reap the advantages of these improved arrangements for their consumers and the shareholders under their co-partnership for the division of profits above the standard dividends, they unfortunately found themselves once more confronted with higher prices in the coal market, which threatened to divert the whole of this benefit to the coal owners and the miners. Those of the shareholders who had read a letter in the Press the other day from an anonymous writer, purporting to know the mind of the coal owners, were doubtless astonished at the intention announced—now that the demand for coal in the iron trade and the foreign supply, conduced to higher prices—to permanently raise the price of gas coal to an equality with other coal, and to abstract in that way, for the benefit of the coal owners, a large part of what the anonymous writer described as the inflated profits of the industry. The writer obviously knew but one side of his subject; and might yet find his prey was hardly worth the effort of capture in the mode contemplated. However badly the colliery owners might have done on their avowed average of 5 per cent. for so many years, the writer appeared to be oblivious of the fact that, since the days of the auction clauses, now some thirty years ago, the capital of gas companies had earned for investors no more than the poor yield the writer said the colliery owners had had on theirs, and he appeared also ignorant of the division with the consumers of the profits above the standard rates—a large portion thereof being taken in the reductions of the price of gas under the sliding-scale. He (the Chairman) could only say with regard to this gentleman and his prognostications, that it not infrequently happened that spoliators miscalculated their factors. In any case, consumers of either municipal or company gas must deplore the withdrawal last year of the export duty on coal as a great misfortune for them as well as for the makers and sellers of gas. He had, at a previous meeting, referred to the disastrous results imposed on the home consumer by reason of the price exacted from the home gas industry upon the terms made with foreign buyers of our gas coal, who seemed to fall such easy victims to enhanced prices year after year, and obligingly created precedents that were afterwards made to govern home sales. This year as last, prices were being set not on competitive negotiations with the home industry, but on terms obtained under a foreign contract, rendered more possible by the abrogation of the shilling per ton export duty. To allow foreign buyers to come and take the coals of this country at their own prices without an export duty, and so to raise its price against users in this country, was scarcely creditable trading. While the Board of the Bromley Company had remained silent on the question of the price of gas until purchases were made, intimation had already been given by some of the other companies that they might have to raise it. If it should be so, he hoped that every thoughtful gas consumer would consider well what his part should be in relation to a question which was of such vital importance in the supply of cheap gas. In subsequent remarks, the Chairman referred to the extension of the incandescent gas-burner; mentioning that the Borough Council had recently ordered the remaining public lamps to be so fitted. The Company had also arranged for a special inspection of consumers' fittings by experienced men, and their adjustment whenever they required it. Following on, reference was made by the Chairman to the grief of the Directors at the sudden death of their esteemed colleague, Mr. A. E. Willett; and high tribute was paid to Mr. Willett's personal qualities as a man and as a Director. To fill the vacancy, he also announced that the Directors had selected Mr. Edward Latter, the senior partner in the old legal firm with which Mr. Willett was associated. Mr. Latter was the eldest son of the late Mr. Robinson Latter, his (Mr. Dickson's) predecessor in the chair, who strove long and faithfully for the interests of the Company. Regarding the accounts, the Chairman said the increase in the half year from gas and meter rental, with the rental from fittings and stoves, was £808. The returns from residuals had not been so satisfactory by £395. While the price of coke had improved, there had been so substantial an increase in the quantity consumed on the works through various causes (principally connected with the reversion of working to the old retort-house during the installation of the new coke-handling plant in the modern one), that the quantity sold had been rather less. Coal cost £1350 more; but adjusting the variations in the other items of the expenditure, the net additional expenditure worked out to £1242. The balance this year was not, therefore, so large by £828. But, having accumulated the surpluses of past years, they had been able to continue so far the price of gas at the reduced rate of 2s. 11d. per 1000 cubic feet; and, after applying £2045 of the accumulations in payment of the half cost of the new coke-conveying plant, they would have in hand, after paying dividends as heretofore, the sum of £2187 to carry forward to the next account.

The Deputy Chairman (Mr. B. H. Latter) seconded the motion, which, after an explanation of one or two items in the accounts, was unanimously adopted.

Proposed by the Chairman, and seconded by Mr. S. J. Wilde, a dividend was declared at the rate of 6 per cent. per annum on the "A" ordinary stock and 4½ per cent. on the "B" ordinary stock, both less income-tax.

The retiring Directors (Mr. S. J. Wilde and Mr. Hugh Wyatt) and Auditor (Mr. A. S. Hicks) were all re-elected.

Moved by Mr. F. W. Church, and seconded by Mr. T. Wilkins, a hearty vote of thanks was passed to the Chairman and Directors.

The Chairman, having acknowledged the vote, made well-merited recognition of the services of the Engineer (Mr. W. Woodward) and of the Secretary (Mr. H. W. Amos).

Mr. Woodward and Mr. Amos responded; and the proceedings then concluded.

BOURNEMOUTH GAS AND WATER COMPANY.

The New Gas-Works—Continuous Carbonization in Vertical Retorts.

The Ordinary General Meeting of this Company was held on Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. Crispe Whiteley in the chair.

The Secretary (Mr. William Cash, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said it was with much pleasure he brought them before the proprietors. The half year had not been a very grand one for gas companies—mainly because of the fine weather that existed during the best part of the six months, and the extremely mild weather during the winter part. He need not say that Balmy Bournemouth and Sunny Boscombe had had their full share of bright weather; and although they could congratulate the inhabitants upon having this weather, from the Company's point of view they could have preferred that it had been a little more inclement. Since then there had been cold and sharp weather; and so, from the Company's standpoint, they had had a better time, and had done a better business. But in spite of the unfavourable influences of the half year, their revenue receipts showed a satisfactory increase under every head. He might add that the fact that they had not during the past six months proceeded by the leaps and bounds to which they had been for so many years accustomed, was partly due to building operations in Bournemouth not having been quite so extensive as they had usually been. There seemed to be some slight slackening off, possibly because building had been progressing too fast in past years; and he thought that perhaps it was better and wiser to have progress a little more regular. However, they need not be alarmed as to the future. Anyone driving round about Bournemouth, especially in the neighbourhood of the new Queen's and King's Parks, would see that enormous estates were being laid out for building purposes, which would, in due course, he had no doubt, be covered with houses as other estates in Bournemouth had always been. The Company's customers appeared to be satisfied. They appreciated the accommodation the Company provided for them at their shops both at Boscombe and in the Christchurch Road; and the sale of fittings had been very good at both places. It was an encouraging fact that they were selling more of their gas fires and cookers now, rather than letting them out on hire, which was better both for their customers and themselves. As for the new gas-works at Poole, the Board had recently visited them; and they were now in working order. He could most sincerely and heartily congratulate the proprietors upon these works, which, in his opinion, redounded very highly to the credit of their General Manager and Engineer (Mr. Harold W. Woodall), from whose designs, and under whose supervision, they had been constructed. The works appeared to him (the Chairman) to be a perfect marvel of method and arrangement—nearly every modern idea and view had been incorporated in them. The great point about them would be the economy in the production of gas. The present accounts showed at once the amount of economy they were likely to gain by bringing these new works into operation, because although during the six months they had carbonized more coal, and had had coal at a higher price per ton than in the corresponding half year of 1905, they had produced gas at less cost per ton, owing to the saving on the carriage of coal, and getting it to the Poole works. There at once was a striking effect of the new works. As he said, the proprietors might congratulate themselves upon the possession of these works—not only for the present but for the future, because while they were able to turn out from them at the present time 2½ million cubic feet per day, they had there coal-handling plant and other buildings sufficient for a production of double this amount. This would show the way in which their Engineer had been dealing not only with the present, but had thought for the future. The zeal and enthusiasm Mr. Woodall put into the work was certainly considerable and undeniable. It might interest the proprietors also to know that at the Bourne Valley works, they had erected some vertical retorts—in fact, they had given their Engineer a free hand with regard to this matter—and these had now been in operation for some weeks. He (the Chairman) thought he might say on behalf of the Board that, from what they had seen, this system had passed from the experimental stage, and that the problem of continuous carbonization was now practically solved. If these vertical retorts created a revolution in the gas world, as some people expected, and other people hoped they would do, the Company would be able to claim that they were one of the pioneer companies, if not the pioneer company, in assisting to create that revolution; and the Company would also have the full advantage of the benefits that might arise from such a change. He need not detain the proprietors for long over the accounts. They had perhaps noticed that the Directors were not

placing the usual £1000 to reserve this half year, because they found the reserve fund now came to more than £50,000; and it was thought that, for the present at least, they might leave it at the amount named. Half the reserve was invested; and half was being used in the Company's business. And as they were writing off from capital—very properly and rightly—large sums for buildings which the new Poole works replaced, the Board thought that for a time they could leave the reserve fund alone. Then with regard to the revenue account, there were no points to which he need particularly draw attention. They had had to spend, as he warned the proprietors they would have to do, a little more money before Parliamentary Committees; and this now appeared in the item of £260. Due to this expenditure, they had been able to retain a very important district for the supply of water for the future, which he did not think they would have been able to do if they had not put on a strong face before the Parliamentary Committees.

Mr. Corbet Woodall seconded the motion; remarking that there was not much in the accounts that called for notice which had not been fully dealt with by the Chairman. He had no doubt those proprietors who had looked into the accounts with care would have observed the large amount that had been spent on repairs and renewals. But when changes were taking place such as those that had been occupying so much of their attention—involving practically the removal of their manufacture from Bourne Valley to Poole—it was inevitable that there were demolitions and alterations made, both at the old and the new works, which could not be fairly charged to capital, and must come upon revenue. The extra costs amounted to nearly £4000; and had it not been for this, there would have been a satisfactory increase in the balance, instead of a small one, to go to profit and loss. However, for his own part, he always thought money was better spent in such ways than merely accumulated and invested outside the undertaking. He shared the feelings expressed by the Chairman as to the new works, the saving effected by which he had referred to. If, however, he might venture to qualify the Chairman's remarks in one small particular, he would say that the saving was due not simply to the greater facilities for obtaining coal at Poole as compared with Bournemouth, but also to reductions in cost of labour, &c., at the new works.

Mr. Bosher said if the Directors thought it prudent to answer, he should like to know how the Company stood in regard to coal for the next twelve months. In Yorkshire they held the view—of course, it might be incorrect—that they were in for an exceedingly bad time respecting high coal prices. He was wondering whether the Company had been fortunate, as several companies had been, in contracting for coal for a considerable period ahead.

The Chairman said he had carefully kept off the coal question. But he did not disguise the fact, and the Board were quite alive to it, that there were troubles possibly before them; and they would try to meet them as well as they possibly could. The Company had not got contracts ahead; and they would have to face the storm, as they had faced it before. They would anyway get through it in the best possible way.

The motion was carried unanimously.

Moved by the Chairman, and seconded by Mr. S. L. Rymer, dividends were declared at the rate per annum of 14 per cent. on the ordinary shares, 7 per cent. on the "B" ordinary shares, and 6 per cent. on the preference shares, after paying which the sum to be carried forward will be £4296.

Proposed by the Chairman, and seconded by Mr. Rymer, Mr. Corbet Woodall was returned to his seat at the Board; and a subsequent resolution, moved by Mr. Pilley, and seconded by Mr. Glen, reappointed Mr. J. C. Benwell, F.C.A., as one of the Auditors of the Company.

The Chairman then proposed the increase of the Secretary's remuneration by £200 per annum. He remarked upon the great growth of work that their progressive business had cast upon Mr. Cash and his staff, and pointed out that the remuneration paid to Mr. Cash included the use of office and staff.

Mr. A. W. Oke seconded the motion, which was very cordially agreed to.

Mr. Cash expressed his gratitude, and then gave some particulars as to the remarkable growth of the Company. The gas sold had doubled during the past seven years; having risen in that period from 313 million cubic feet to 664 millions. The number of consumers had also enormously advanced, due in part, of course, to the introduction of the prepayment system. The proportion of gas consumers to water consumers was still most excellent. In fact, they were in the extraordinary position that—whereas water was a necessity of life, and the Company were supplying practically every one of the houses in the district, and gas was an optional thing, and was in competition with electricity—their total number of water consumers at the end of last year was 14,500 and their gas consumers 18,000. This was partly accounted for by the fact that they were not supplying Southbourne and Poole with water. But the policy of the Board had been in this direction, and therefore the two things had maintained the balance which they had occupied for a long time.

Moved by Mr. Bosher, and seconded by Mr. Barrett, a hearty vote of thanks was passed to the Chairman and Directors and to the officers and their staffs.

The Chairman, the Engineer, and the Secretary responded. Mr. H. W. Woodall, referring to the interesting figures given by Mr. Cash, said the output having doubled during the last seven years, the 4 per cent. increase in the past half year was one with which, he thought, the proprietors might be content. The concern was getting a big one now; and it therefore became more and more difficult to maintain the percentage rate of increase on the enlarged output.

The proceedings then terminated.

The Portrush Gas Company have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a steel tank, 45 ft. 6 in. diameter and 18 ft. 6 in. deep, and a single-lift spiral-guided gasholder, 42 feet in diameter and 18 feet deep, complete with foundations. The work is to be completed by the middle of May, to the satisfaction of Mr. W. C. Pinkney, the Company's Engineer and Manager.

BARNET DISTRICT GAS AND WATER COMPANY.

A Satisfactory Report.

The Half-Yearly Meeting of this Company was held on Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. Alfred H. Baynes in the chair.

The Secretary (Mr. E. W. Drew, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, said he thought his first words that day on behalf of his colleagues and himself must be to express deep regret at the sudden and lamented death of Mr. I. A. Crookenden, who had for several years been a Director of the Company. They all felt that he rendered signal service to the undertaking; and he had no doubt whatever that the shareholders would join with the Board in giving expression to their respectful and most sincere sympathy with the bereaved family and relatives in this time of sore loss and trouble. The shareholders would probably have noticed from the report that the vacancy on the Board created by the death of Mr. Crookenden had been filled by the unanimous election of Mr. Frederick Lennard, who had for more than thirty years been Auditor of the Company. The Directors felt that they could look to Mr. Lennard for most valuable service; and they congratulated themselves on having him as a colleague. Referring to the report, and dealing first with the gas undertaking, it was satisfactory to know that during the six months to Dec. 31 there was an increase in the gas made of 4,373,000 cubic feet, as compared with the corresponding period of 1905; and 401 tons more coal were carbonized. The gas sold was 3,134,000 cubic feet more; while the average make of gas per ton of coal during the past half year was 10,873 cubic feet. The cash received for residuals was £299 more—largely due, of course, to the increased price of coke. Of tar, there were 6342 gallons more made; the make per ton of coal being 11½ gallons. Then 59 tons of sulphate were manufactured, giving nearly 20 cwt. per 100 tons of coal. The total cash receipts for gas during the past six months were £11,255; being an increase of £531. The net profit on the sale of gas and residuals was £4307, or £227 more. On the expenditure side there had been an increase of £1133, which was accounted for in the following way: Rates and taxes—which seemed to go up constantly—were £186 more; additional coal, £333; and £600 was accounted for by the insertion in full of the receipts from stoves and fittings on the credit side of the revenue, and the amount for repairs and depreciation entered on the debit side for the first time. There had been an increase in the number of slot-meters; the total in use at present being 1131. With regard to the Water Department, the receipts for the half year were £16,444, or an increase of £1084 on the corresponding period. The expenditure, however, showed an increase of £1978, which was mainly accounted for as follows: By an increase in rates and taxes amounting to £467; extra fuel used in pumping, £422; and increase in wages, £264. The total net profit on gas, residuals, fittings, and water-rates for the half year, after allowing for interest on loans and income-tax, and a sum of £9434 required to meet the payment of the dividends as recommended in the report, left a balance of £1807 to be added to the balance to be carried forward to the next account. During the past half year, 1754 yards of gas-mains and 8496 yards of water-mains had been laid. The quantity of water supplied was 283,349,000 gallons—an increase of 39,261,000 gallons. Perhaps they would remember that at the last half-yearly meeting he told them the Directors were engaged in making arrangements for securing an ample provision of water so as to meet the increasing demands of their large and rapidly growing district. He then said that they had resolved to sink a new well at Northaw; and this work was now in progress. He was also glad to tell the shareholders that day that they had sunk a well at East Barnet for a depth of 240 feet; and this was giving a yield of a million gallons per 24 hours. They were also constructing at Arkley a reservoir capable of holding 2 million gallons of water, in pursuance of the powers contained in their last Act; and he thought, in looking at the position that day, they might well congratulate themselves on the condition of the Company.

Dr. J. W. L. Glaisher seconded the motion.

Mr. Dyer asked if anything was being done in the way of getting a reduction in the rates and taxes. At the South Metropolitan meeting a few days ago, Sir George Livesey said that 7 per cent. of the money paid for gas was absorbed in the rates and taxes. This was a very large item; and he (Mr. Dyer) thought it was one that ought to be seen into. Gas and water companies should do their utmost to get it reduced. He found that in several places the charges for rates and taxes amounted to something like 1¾d. per 1000 cubic feet; while in others the figure was 3½d. Such a state of things as this, one could not understand. Surely there were some means of getting a uniform charge. The pumping expenses were rather high, but he presumed this was in connection with the new well. On the whole, it was an excellent report; and he heartily congratulated the Board on the position of the Company.

The motion was then carried; and on the proposition of the Chairman, seconded by Mr. Alfred Lass, F.C.A., dividends were declared, less income-tax, for the half year, at the rates of 7½ per cent. per annum on the "A" and "C" stocks, 6½ per cent. on the "B" stock, and 5¼ per cent. on the "D" capital gas and water stocks.

On the motion of Mr. A. F. Phillips, seconded by Mr. Lass, the retiring Directors (Mr. Baynes and Dr. Glaisher) were re-elected; and on the proposition of Mr. J. E. Plummer, seconded by Mr. Dyer, the retiring Auditor (Mr. C. P. Crookenden) was also re-appointed. Proposed by Mr. Plummer, and seconded by Mr. Samuel Cutler, Mr. B. D. Holroyd was appointed Auditor in place of Mr. Lennard, who has vacated the position on his election to the Board.

On the motion of Mr. Cutler, seconded by Mr. James Randall, the Chairman and Directors were heartily thanked for their services; and the proceedings concluded with a vote of thanks to the Manager, Secretary, and staff, which was acknowledged by Mr. T. H. Martin (the Engineer), Mr. E. W. Drew (the Secretary), and Mr. T. Wright (the Cashier).

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

Income-Tax Allowance in Respect of Depreciation—Prospects of the Electricity Project.

The Ordinary General Meeting of this Company was held last Thursday, at the Company's Offices, No. 50, Cannon Street, E.C.—Mr. JOSEPH MANWARING in the chair.

The SECRETARY (Mr. W. A. Schultz) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said that, at the corresponding meeting last year, it was his duty to refer to a slight decrease—amounting to about a ¼ million cubic feet—in the output of gas for the half year. He was glad to say, however, as the Board anticipated, this was only a temporary decrease; and while they were able to record an increase for the next half year, he was pleased to report that they were now able to point to an increase of nearly a million cubic feet, or to be exact 893,000 cubic feet (4½ per cent.), over the corresponding period of 1905. Through this, notwithstanding the reduction of 3d. per 1000 cubic feet in the price of gas for lighting purposes, the receipts had increased by £99. Though this sum was small, is was very satisfactory, in view of the reduction in price. The residual products had also yielded a better result, which was partly assisted by the completion of the installation of a sulphate plant, just before the close of the year. The total revenue showed an increase of £228, while the expenditure had increased by only £17; leaving the net profit £2241, as against £2030 for the corresponding half year. After deducting the interest on the debenture stock and temporary loans, there remained £2000 actually earned; while the balance at the credit of the profit and loss account was £2559. The Directors recommended the payment of a dividend at the rate of 5½ per cent. per annum, and they had specified the sum of £178 10s. for setting aside towards the depreciation fund for the renewal of plant. This sum was not an arbitrary figure, but represented one-half the annual amount now allowed by the Special Commissioners for income-tax in respect of wear and tear of plant and machinery. It would be remembered that the Secretary was instructed to lodge an appeal with the Inland Revenue authorities for obtaining this reduction; and he had been successful in establishing the rule that, in future, an allowance of 3 per cent. would be made on the present value of the plant and machinery in respect of such depreciation. The amount expended on capital account had been £1950. The capital account was in debit by the amount of £946; and this, with the expenditure on gas-stoves and the necessary working capital, had caused an overdraft at the Bank of £1209. The Directors, therefore, proposed to shortly issue the remaining debenture stock under the Act of 1882. One satisfactory feature in the working results was that the unaccounted-for gas had amounted to only 5·37 per cent., while the quantity of gas sold had been 10,260 cubic feet per ton of coal carbonized. Considering the Company's large area, extending over nearly 50 miles of mains, this reflected great credit upon the care exercised by the Engineer (Mr. A. E. Brooks). The number of consumers at the end of 1905 was 1107; whereas they now numbered 1197. The Directors, as promised at the last meeting, had given the matter of the erection of electrical plant their very careful consideration during the half year; and they had sought the advice of Mr. A. H. Dykes, of the firm of Messrs. Handcock and Dykes, of Westminster. Upon the instruction of the Directors, the Engineer and the Secretary had visited several electrical works where the conditions of the neighbourhood were similar to those at Ascot; and the Directors had had before them approximate estimates from Mr. Dykes as to the cost of laying down the necessary plant, and the probability of the demand in the neighbourhood of Sunningdale and Sunninghill. The Camberley Electric Lighting Company gave notice of their intention to apply to the Board of Trade for power to supply electricity in the heart of the district authorized to the Ascot Gas Company. The Directors thereupon instructed their Parliamentary Agents, Messrs. Lees and Butterworth, to oppose the application; and he (the Chairman) was pleased to say that, for the present session, the application had been dropped. If, therefore, the Ascot Company proceeded to exercise their powers under the Act they obtained last session, it was possible the application would not be repeated. When the Directors were in possession of the tenders for the various portions of the plant, it would, of course, be necessary to take steps to raise the capital to provide for this part of the Company's operations. The shareholders might, however, be quite assured that the intention of the Directors was to exercise the strictest economy in relation to this matter, as they were satisfied that, with the judicious expenditure of capital, this part of the Company's revenue would in a very short time prove remunerative. He thought the shareholders would agree with him that the accounts disclosed a very satisfactory state of affairs, and that the prospects for the future were very hopeful.

Mr. H. W. SMITH, in seconding the motion, said the balance-sheet was very satisfactory; and the working was good. Although but little more coal had been used, more gas had been made by 893,000 cubic feet. He advised caution in entering into the electricity undertaking. He preferred his fairly certain dividend of 5½ per cent. from gas.

Mr. SAMUEL SPENCER also congratulated the Directors upon the accounts. He noticed, however, rates and taxes showed an increase of about 80 per cent., and asked whether this arose from increased assessments.

From replies to questions, it was gathered that the present coal contract runs to the end of June, and that the cost of coal delivered on to the works is now about £1 per ton. As to the increase in the rates, it was explained that the assessment was formerly low; and on the re-assessment, the Company's valuation was about trebled. On appeal, however, it was reduced to about double the former figure. It was proposed to generate electricity by suction gas; but nothing beyond the preliminary work for a scheme would be undertaken without consulting the proprietors.

Mr. DYKES, invited by the Chairman, spoke of the advantages of the administration and control of gas and electricity undertakings being under one Board and officers; of the savings to be effected in this manner; and of the safety to capital that the absence of competition gave to those who invested their money. The fact that there were many houses in the district already wired showed that a demand for electricity existed. By using suction-gas plant for generation, a market was created for the gas-works coke; and they would have their own gas as a stand-by. He considered that the Company were in a strong position in this matter.

The motion was unanimously carried.

A resolution was passed declaring a dividend at the rate of 5½ per cent. per annum, setting aside £178 10s. for renewals, and carrying forward the balance of £730. Succeeding this, Messrs. F. Bridges and Henry Woodall were re-elected to their seats at the Board; and the Auditors (Mr. T. A. Welton and Dr. Strong) were re-appointed.

Mr. H. WOODALL, in acknowledging his re-election, said he was sure it would be to the advantage of both consumers of gas and electricity that both sources should be in the hands of one Company than in the hands of two, which would call for the expenditure of far more capital. If electric lighting were well established, it must redound to the profit of the shareholders in the existing Company; and it gave a certain amount of security to gas shareholders that they would not otherwise have. They had until next August twelve months in which to move; and he did not therefore think the Directors would have resorted to anything in the way of capital expenditure until they met the shareholders again.

The usual votes of thanks were passed to the Chairman and Directors, and to the officers; and the proceedings then terminated.

PROVINCIAL GAS COMPANIES.

Increased Profit at Barnstaple.

Presiding at the annual meeting of the Barnstaple Gas Company, Mr. C. E. R. Chanter said the revenue for the year 1906 was £9467, which was an increase of £619 over that for 1905. This was almost entirely attributable to private lighting, which in 1905 brought in £6342 and in 1906 £6711, or £369 more. Another satisfactory increase was one of £229 in the revenue from coke. The expenditure for the year was £7115, compared with £6807 in 1905; and the balance carried to the profit and loss account was £2352, against £2040. This increase was especially gratifying, in view of the fact that the expenditure on repairs had been very large. Gas companies had to face a rise in the price of coal. Fortunately for the shareholders in the Company, the Directors had made their contracts forward to a large extent; and only a few days before the rise took place, at the suggestion of their Manager, they purchased an additional 1000 tons. At present they had coal bought forward at the price before the rise to the extent of nearly 3000 tons. Mr. Chanter went on to show that, in spite of the opposition of the municipal electricity undertaking, the business of the Company had increased largely. Since 1898 the revenue had grown from £7513 to £9467; while the number of consumers had increased from 981 to 1703, and of cooking-stoves on hire from 203 to 786. The price of gas had been reduced from 3s. 9d. to 3s. 6d. per 1000 cubic feet. He also referred to the public lighting. In 1902—the last year in which gas only was used—the cost of lighting the town was £759; whereas last year, when it was lighted by gas and electricity, the cost was £2091, of which only £302 was paid to the Gas Company. He wished the Corporation would put incandescent burners in the lamps still lighted by gas. If this were done, he was satisfied that a comparison of the light produced by incandescent burners with the ordinary incandescent electric light would be of very great benefit to the ratepayers at large, and also to the Company. The report was adopted and the usual dividend declared.

Ten Years' Progress at Bromsgrove.

At the recent annual meeting of the Bromsgrove Gas Company, the Chairman (Mr. John Green), in moving the adoption of the report, congratulated the shareholders on the result of the past year's working, which had produced a profit of £2122. He remarked that one of the most satisfactory and reassuring features in connection with the undertaking was the steady and continuous increase in the demand for gas. This could be best shown by a comparison; and though comparisons were said to be odious, he thought in this case it would be agreeable. In the year 1896, the quantity of gas made by the Company was 23 millions; whereas last year it exceeded 50 millions. Ten years ago they had not a prepayment meter or stove in use; at the present time they had 607 of the former and 447 of the latter. In addition to this, there had been a steady augmentation in the number of ordinary consumers; and they were still increasing. It was a very gratifying thing to the Directors to find that the use of the incandescent burner and mantle was gradually displacing the old and unsatisfactory flat-flame burner. They were quite aware that the improved burner tended to diminish the consumption of gas, and consequently to lessen the bills; but they were perfectly satisfied with this position, and were looking to increase their output by adding to the consumers, and also by the development of the uses to which gas was adaptable, such as heating and cooking. He need only add that the Company were still progressing, and they hoped to go on, he would not say rapidly, but steadily. The report was adopted, and a dividend was declared on the original shares of £5 10s. per cent. (making £8 10s. per cent. for the year), and on the "B" shares of £3 17s. per cent. (making £5 19s. per cent. for the year), free of income-tax. In the course of the subsequent proceedings, gratification was expressed at the reduction which had been made in the price of gas; and the thanks of the meeting were given to the Secretary (Mr. T. Roper) and the Manager (Mr. A. Bird), for the conscientious discharge of their duties.

Increased Consumption in Chester.

In the report presented by the Directors of the Chester Gas Company at the half-yearly meeting on Monday last week, they stated that the quantity of gas sold in the six months ending Dec. 31 last showed a substantial increase; and the demand for gas cookers, fires, and other apparatus had been very satisfactory. Considerable expenditure had been incurred on the works in the repair of plant and in rectifying

the Company's boundaries in accordance with agreements with the Corporation. There was a reduction in the revenue from residuals, owing to the markets being lower throughout the half year. After providing for interest on loan capital and dividend on preference stock, there remained a balance to the credit of the profit and loss account of £4144, out of which the Directors recommended payment of a dividend on the ordinary stock at the statutory rate of 2½ per cent. in respect of the half year. In moving the adoption of the report, Mr. J. G. Frost, who presided in the absence of the Chairman (Mr. John Gamon) through illness, said it was satisfactory to record that there was an increase of £529 in the sales of gas; but there was a drop in the receipts for residuals of £203, and the net increase on the revenue receipts was £324. The extra expenditure was £238. There was left for profit £5591, which was £86 more than in the December half of 1905, and was more than sufficient to meet the dividend and interest. The demand for gas showed a steady increase throughout the year; and the total quantity sold had been 223 million cubic feet, against 215 million cubic feet in 1905, which was a record year. The total funds in reserve and for carrying forward amounted to £13,539. The report was adopted and the dividend declared.

Good Results at Ipswich.

The report submitted at the recent annual meeting of the Ipswich Gas Company stated that the balance of profit and loss for the year ended Dec. 31 (after payment of the interim dividend) was £10,603. The Directors recommended the payment of further dividends at the full statutory rates on the various stocks. This would leave a balance of £4588 to be carried forward. In presenting the report and balance-sheet, the Chairman (Mr. D. Ford Goddard, M.P.) said the year that they had gone through had been a very prosperous one for the Company, in spite of the keen competition of electric light carried on by the Municipal Authority, with the bottomless purse of the ratepayers behind it. Notwithstanding this, more gas had been sold last year than had ever been sold before in Ipswich. The total number of consumers on their books had now reached 13,595, which was an increase of 891 during the year. They had on hire 5143 cooking-stoves, which had become a very important branch of the business. There were at the present time 165 gas-engines in the town using the Company's gas, without mentioning the enormous number of gas-fires, which almost every user of gas found a comfortable and cheap addition to the household requirements. The result of all this had been that they had sold during the past year 409,561,000 cubic feet of gas. He was pleased to say that they were now feeling the full benefit of the mechanical retort-house appliances which were adopted some years ago; while the unaccounted-for gas had reached a lower amount than had ever before been recorded in the history of the Company. They had looked the problem fairly in the face; and he did not think they would have to increase the price of gas in order to meet the greater cost of coal. As to the revenue account, private and public rentals showed an increase of £1629. Residuals were less, because the amount of coal used had been less; but they had used instead of 8698 tons of coal, 877 tons of oil to enrich the gas which they made. Purification had cost £300 less; but this did not mean that there was less purification. The fact was there had been less gas from the coal to purify. They had, as a matter of fact, received a large number of complaints about the smell of the gas; but as a general thing they had been able, on investigation, to trace the complaints to defective burners. The smell was in no sense due to want of purification. In consequence of the Special Act they had obtained, they were not now under any statutory obligation in regard to the sulphur compounds in their gas; but they had striven, and had succeeded in maintaining just the same quality as regarded purity as when there was a severe penalty attached. He said this publicly, because everybody thought that, in consequence of the Act, something was done to render the gas less wholesome, which was not a fact. He was glad to say that the wages bill had been reduced by £1000 in the retort-house. This was entirely due to the circumstance that there were less men employed. They had renewed the contract with the Corporation for the public lighting for another two years. It was with regret that the Directors had to inform the shareholders that, owing to what they considered the unfair action of the Overseers in raising the assessment of the undertaking to an unreasonable figure, they felt obliged, after having applied in vain to the Assessment Committee for relief, to appeal to the Recorder at Quarter Sessions. The Recorder's decision was in favour of the Company; but against this the Guardians had decided to appeal. It behoved him to be careful what he said, as he did not want to prejudice the result; but the Board looked forward to the result with every confidence. The net result of the accounts was that they carried £13,142 to the profit and loss account, as against £12,555 last year. He was very glad to be able to make such a report to the shareholders. The report was adopted and the dividends declared; and the proceedings closed with votes of thanks to the Chairman and the Engineer (Mr. J. T. Jolliffe) and staff.

A Small but Progressive Company.

Though the operations of the Leominster Gas and Coke Company are not of great magnitude, the Directors were able, at the annual meeting last Saturday, to recommend the payment of dividends at the usual maximum rates. The Company sold rather more than 22 million cubic feet of gas last year for ordinary consumption; being an increase of about 207,000 cubic feet. In the course of the past few years, a large amount has been spent in putting the works, as far as possible, into a complete condition. But now that there is no necessity for further outlay, beyond that entailed by ordinary repairs and renewals, there is a prospect, unless coal advances, of a reduction in the price of gas from the present figure of 3s. 4d. per 1000 cubic feet. The Manager (Mr. C. Eastment) has well-equipped works, and he may be relied upon to carry them on as economically as is practicable.

The Coal Question at Newmarket.

Mr. R. Stephenson, J.P., when presiding at the annual meeting of the Newmarket Gas Company on Monday of last week, said that though the receipts from the sale of gas had diminished by £254 during the year, the profits had increased by £188. Coal had cost less, and the expenses of maintenance had been reduced. The present coal contract would not expire till next autumn; and after that the cost of coal might be substantially greater. Next year they would, too, have to renew four benches of retorts at a cost of about £300. Though he had always been, and still was, a Free Trader, he was entirely in agreement with the remarks recently made by Sir George Livesey. Every industry in the country was absolutely dependent upon a regular and constant supply of coal; and it was a grave mistake to take off the export duty. The foreign demand was very fluctuating, and practically upset every trade, with the result that the damage done to British industries was greater than any benefit coal owners and miners derived from an increase in the price of coal. The report, which was adopted, stated that the net balance of profit earned during the year to Dec. 31 was £4296, and a balance of £1588 had been brought forward from the previous year. Debenture interest amounted to £162. It was recommended that a dividend of 6½ per cent. be declared, and that the balance, amounting to £2017, be carried forward.

PROPOSED FEDERATION OF POTTERIES TOWNS.

An inquiry has lately been held at Stoke-upon-Trent, by Major C. E. Norton, R.E., one of the Inspectors of the Local Government Board, into an application by the Town Councils of Stoke and Longton for a federation of these boroughs and the urban district of Fenton into a county borough. Mr. Honoratus Lloyd, K.C., and Mr. B. C. Brough appeared for the Joint Committee of the two Town Councils; and Mr. J. D. Fitzgerald, K.C., and Mr. Hutchinson represented the Fenton Urban District Council, who opposed the scheme, in company with the County Council and a number of manufacturers, tradesmen, and property-owners of Longton, for whom Mr. Vesey Knox appeared. The Staffordshire County Council were concerned in the project; and their interests were looked after by Mr. W. J. Disturnal. Arrangements had been made for evidence on behalf of the applicants to be given by Alderman Geen, who was to deal with financial matters; by Mr. Corbet Woodall, who was to take up questions of gas supply and management; and by Mr. G. R. Strachan, whose special experience on sewage treatment was considered to be valuable. For the opposition, Mr. W. Cash (of Messrs. Cash, Stone and Co.), Mr. Charles Hunt, Mr. J. W. Wilcox (one of the Consulting Engineers for the Birmingham sewage scheme), and Mr. Alexander Scrivener were to give evidence in their particular departments.

The inquiry was opened by Mr. Honoratus Lloyd, who explained the object of the application, gave a history of the federation movements in the Potteries towns, and generally outlined the scheme for which the applicants were seeking authority. He argued that the three towns together really comprised one district; that there was a great community of interest between all the areas; and that unification would tend to economy and greater efficiency in municipal administration. He contended that work was now being done by each town individually, in matters like sewage disposal, gas and electricity production, &c., which it would serve the common interest better to have in the hands of one authority. He concluded by stating that the proposal was that for a period of (say) five years (though they did not tie themselves to this period, because if it was too long or too short the matter was one for discussion), there should be five rating areas, three in Longton, as now, and two others, Fenton and Stoke; and that each of these should bear its own particular expenses, and should contribute only to a common fund for the purpose of common expenditure. He said he did not propose to go into the details; but Alderman Geen would lay the matter before the Inspector, and any criticisms he would be only too willing to discuss, as the one object the memorialists had in view was to try, if possible, to be fair, not only to themselves, but to others.

The first witness called was the Town Clerk of Stoke (Mr. J. Blow Ashwell), who was followed by his colleague at Longton (Mr. G. C. Kent), who was under examination when the inquiry was adjourned for the day. The next morning was occupied with evidence by the Borough Surveyor of Longton (Mr. J. W. Wardle) and the Medical Officers for the two memorializing towns (Drs. Dawes and Petgrave Johnson). Alderman Geen, who was subjected to a long examination on the financial aspect of the question, put in a statement he had prepared which furnished the following particulars in regard to the three towns proposed to be federated:—

	Stoke.	Fenton.	Longton.
Estimated population, March 31, 1906	33,500	24,300	36,900
Area in acres	1881	1752	1947
Rateable value	£119,965	£91,601	£122,741
Loan liabilities	£191,913	£103,387	£315,210
Current rates	8s. 5d.	7s. 4d.	8s. 7d. (aver.)

In the afternoon of the second day of the inquiry, Mr. Corbet Woodall was examined by Mr. Honoratus Lloyd. He said he had for some years been intimately acquainted with the district, all the three gas-works in which were well managed; but he thought amalgamation would result in more economical production of gas. In this particular case, the controlling staff was multiplied by three; and he did not think that, after the amalgamation, the staff would be any larger than the present for one section of the works. Then the capital invested in he three undertakings was also greater than would be needed in one doing the work of the three. In regard to the distribution, each could help the other, because the extremities of one would come into the neighbourhood of the main supply of another; and generally the expenditure, both on capital and on working, would be smaller. Asked how, supposing the proposed union were carried out, and the three undertakings came under one ownership, he would advise, from an economical point of view, that the manufacture and distribution of gas should be carried on in the future, the witness said the three works were in good condition, and it would be an expensive thing to discontinue them, though this would be the ultimate effect of it. Two works were capable of providing gas for the whole district. Stoke and Longton could do it; and so, with a little extension, could Longton and Fenton. But what would take place at once would be that in the summer time one of the works could do the whole supply, and the other

two could be shut down, and all costs attending them suspended. It the three works had to be operated in the winter, as would be the case after a year or two, two would be worked to give a regular output, and the fluctuations of supply would be taken up by the third. As an illustration, witness said the British Gaslight Company, who supplied Hanley and Tunstall, had works at Etruria and near Tunstall. Last year, a communication main was laid down between the two works, with the result that for about ten months the Tunstall works would be thrown out of action. The result was that upon the gas made at Tunstall there was a saving of 2s. per ton of coal used. Reverting to the subject of the inquiry, witness said the actual quantity of gas sent out on the day of maximum output in 1906 was: In Stoke, 668,000 cubic feet; in Longton, 822,000 cubic feet; and in Fenton, 458,000 cubic feet. Dealing with the productive capacity of the three works, witness stated that those at Stoke were capable of making 900,000 cubic feet; the Longton works, 1,500,000 feet if they used to its full extent the water-gas plant); and the Fenton works, 730,000 feet. So there was a margin from the maximum demand in the case of Stoke of 25 per cent., Longton of 75 per cent., and in that of Fenton of 55 per cent. On the question of gasholders, Fenton had a margin of 90 per cent. If amalgamation were to take place, he would expect the federated borough to be able to make its contracts with regard to coal and materials, and also to get rid of its residuals, on more favourable terms than the present. The joining up of the mains of the three systems would tend to simplify the distribution of gas. He understood that the prices of gas now in the three towns, allowing for discounts, were: 2s. 10d. in Stoke, 2s. 11d. and a fraction in Longton, and 2s. 9d. in Fenton. The price charged for public lighting in Stoke was 2s. 7d. per 1000 cubic feet; in Fenton he believed no charge was made; and in Longton it was, he thought, 2s. 8d. Stoke and Longton had electric light undertakings, and the linking up of these would also, he considered, be advantageous and economical. This was a very strong point at the present moment.

In cross-examination by Mr. Fitzgerald, witness's attention was called to the fact that no charge was made for gas used for public lighting at Fenton, and that the charge there was lower than in the other towns. It was pointed out that in April last year the price was reduced to 2s. 9d., and from the 31st of next month it was to be brought down to 2s. 6d. Witness agreed that this figure was a fair one; but he added that there would be no difficulty in Stoke reducing its price. Asked if it would not be foolish, where there was careful management and a low price, to change the existing conditions in the hope of getting a reduction, witness said there was no reason why they should not do better. He thought all three towns would be benefited by amalgamation. Counsel reminded the witness that last year he advocated the setting up of independent works by the small district of Wolstanton, instead of taking their supply of gas from Burslem and Newcastle at a low price; and he said his reason for so doing was that Wolstanton would be able to supply gas at as low a price as they were paying. "Why then," asked Mr. Fitzgerald, "could not the small district of Fenton do as well?" Witness replied that he was not making the slightest reflection upon Fenton; he had already acknowledged that it was doing very well. But he said that an amalgamated concern would do better than separate works.

After a number of other witnesses had been called, the case for Fenton was opened on the third day. It was argued by Mr. Fitzgerald that Fenton was an old-established and well-governed urban community; that its debt was lower in proportion than that of the other towns; that its rates were also much lighter; that it was well equipped with municipal undertakings; that when a ratepayers' poll was taken, the electors, by an overwhelming majority, rejected the federation proposal; and that from no point of view was there any need to destroy the existing form of local government.

Called in support of the opponents' case, Mr. William Cash gave minute details as to the finances of the town, and informed the Inspector that for the last four or five years more money had been raised than was required for current expenditure, with a view to eventually applying the accumulated surplus to the reduction of the sewage-disposal or destructor debts. Addressing himself to the figures given by Alderman Geen earlier in the day, the witness gave his own estimate of the expenditure required to bring the town up to the level of the neighbouring boroughs.

Mr. Charles Hunt's evidence, briefly stated, was to the effect that though concentration was a good thing in theory, local circumstances must be looked to; and having regard to the fact that the three existing gas-works were well and economically managed, he argued that no saving would be effected by amalgamation.

Other witnesses having been called in opposition to the scheme, Mr. Honoratus Lloyd summed up the case for the memorialists; and the inquiry, which had occupied four days, concluded with a vote of thanks to the Inspector.

PROPOSED SALE OF THE BATH ELECTRICITY WORKS.

At Bath, general satisfaction appears to reign at the prospect of the Corporation having an opportunity of divesting themselves of the electricity undertaking, which has been, since the Corporation purchased it, a kind of millstone round the necks of the ratepayers. A Sub-Committee of the Electric Lighting Committee of the Corporation (whose appointment was chronicled in the "JOURNAL" for Nov. 20, p. 551) have recently been engaged in considering the offer of the Somerset and District Electric Power Company to buy the works, on the basis of the return to the Corporation of the capital cost, together with a bonus of £20,000. The capital cost of the undertaking amounts to £162,697.

When the Sub-Committee started their inquiries into the matter, they took the prudent course of consulting with the Board of Trade, with the result that, in the course of correspondence, the Board intimated that they could not allow the Corporation to contract their successors out of the benefit rights conferred by section 2 of the Act of 1888. Beyond this, the Board hinted that, even in the event of a transfer being made, they would require to be furnished with good reasons before departing from their practice not to allow any sum to be received in excess of the amount actually expended. This created a little difficulty between the negotiators. But they put their heads together; and it was then proposed to make the suggested bonus contingent upon the Company being able to obtain, with the aid of the Corporation, statutory powers for over-riding the Act of 1888, so as to assure the undertaking to them in perpetuity.

Having come to this understanding, the heads of a provisional agreement were arranged. By this, the Company agree to pay the actual capital cost of the undertaking, together with a sum of £2000 expenses incurred by the Corporation in obtaining the Bath Electric Lighting Order, with a bonus, in cash, of £10,000. The assets are not to include the sinking fund of £28,316, nor the sum of about £1076 standing to the credit of the reserve fund. If the Board of Trade persist in their refusal to consent to the transfer, the Company and Corporation will then, in the next session of Parliament, appear as joint promoters of a Bill (at the expense of the Company) to confirm the agreement outlined above. By further clauses in the agreement, it is arranged that, on the undertaking becoming vested in the Company in perpetuity, the Company will, at the option of the Corporation, pay either a further bonus of £10,000 in cash (making in that case a total bonus of £20,000), or supply the Corporation annually in perpetuity with £450 worth of electricity for the purpose of lighting the public buildings at current prices. The Corporation are also given the option of applying this arrangement to the first bonus of £10,000.

Among other conditions that it is intended shall accrue from this scheme of transfer are these: The Company are to reduce the price of public lighting as from April 1, 1908, by ½d. per unit, which would represent a saving on the present public lighting account of about £880 per annum. Then, again, when the Company have paid a dividend of 4 per cent. on the ordinary share capital, the price of electricity for public lighting is to be reduced by a further ½d. per unit; and all the surplus profits after paying 4 per cent. are to be devoted to reducing the cost of private lighting till this has been lowered from 5d. to 4d. per unit. The Corporation also are to be bound to take electricity on the present scale from the Company for street lighting for seven years; but at the expiration of this period, the Corporation will be free to light the streets and public buildings with gas, should they so desire.

The Sub-Committee further looked well into the possibilities of the future, in the event of the retention of the undertaking in the hands of the Corporation; but they made no recommendation to the Electricity Committee regarding transfer or otherwise. However, the Electricity Committee, on considering the report of the Sub-Committee, decided unanimously to recommend the Corporation to enter into an agreement for the sale of the undertaking; and the decision has given the greatest satisfaction to the ratepayers.

PUBLIC LIGHTING OF LIVERPOOL.

Annual Report of the Superintendent.

The report for the past year of Mr. A. G. Smith, the Superintendent of Street Lighting, Gas Examiner, and Official Inspector of Meters to the Corporation of Liverpool, which has lately been issued, contains some interesting particulars in regard to the gas supply of the city.

The city is at present lighted by 18,783 lamps, 13,056 of them being in the old city and 5727 in the suburbs. They are distributed over 451¼ miles. The following table shows the number of burners used in the lighting of streets, courts, and passages:—

District.	Streets.			Courts.	Passages.	
	Flat Flame.	Incandescent.	Electric.	Flat Flame.	Flat Flame.	Incandescent.
Old City	239	9,207	210	833	2342	20
Suburbs	33	4,728	10	..	941	1
Totals . . .	272	13,935	220	833	3283	21

The following figures compare the present lighting (*b*) with that of 1905 (*a*):—

Mileage of Streets Lighted.	Price of Gas per 1000 Cubic Feet.	Total No. of Lamps.	Total Illuminating Power. Candles.		Total Maintenance Charges.
			Before Midnight.	After Midnight.	
(*a*) 445	2s. 4·8d. / 2 3·0	18,589	1,100,792	626,068	£47,665
(*b*) 451¼	2 3·0	18,783	1,111,932	635,260	46,630

The work of fixing incandescent in lieu of flat-flame gas-burners in the public-lamps was very light last year—only 10 lamps having been so treated; but the lighting of 3⅛ miles of new streets was carried out by the erection of 105 single incandescent gas-lamps. The lighting of 2½ miles of road was re-arranged during the year, involving the erection of 1 double and 30 single incandescent lamps, and the removal of 27 existing lamps to new positions; while 92 lamps were shifted owing to the widening of roadways and sidewalks, alterations to property, and other causes. On the 12th of March, the Committee took over the lighting, &c., of the lamps in Hartley's Village and on the Liverpool Land Company's Estate; and they were immediately superseded by those of the incandescent type. The lighting arrangements in Fazakerley are now as follows: Length of streets lighted by incandescent electric lamps, 0·5 mile; do. by incandescent gas-lamps, 1·75 miles; number of lamps (10 electric, 36 gas), 46; average distance between the lamps, 74 yards. By arrangement with the Mersey Docks and Harbour

Board, the lighting of the Floating Roadway Pier Head has been improved. In lieu of the 26 flat-flame globular lamps, 8 high-power lamps of the Scott-Snell type have been fixed, 3 only of which are chargeable to the Corporation; and the work of maintenance is carried out by the Dock Board. Of the 451¼ miles of road lighted at the close of last year, 436⅜ miles were by incandescent gas, 9¾ miles (principally back streets) by flat-flame burners, and the remaining 5 miles by electricity. The average distance between the lamps is 50 yards in the old city and 68 yards in the suburbs.

Early in the year the Committee decided to experiment with the non-lighting of the public-lamps during one week in midsummer, as it was felt that the period of lamplight was so short that no inconvenience to traffic would be experienced if such a course were adopted; while it would at the same time permit of the lighters taking the week's holiday granted by the Council. For this purpose it was decided that the extra day's money which was previously paid to the lighters each month should be retained by the Committee, and paid in a lump sum for the week in which the holiday was taken. Accordingly, on the 23rd of June the holidays commenced, and the lamps, except those on the tram poles, were not lighted; but, owing to the weather being of an unfavourable character for the experiment, and there being numerous complaints from the police, the Press, and the public, the experiment was not continued beyond the 25th of June. The question of the holidays of the lighters was raised at a subsequent meeting of the Committee, and a resolution was passed rescinding the new resolution regarding the week's holiday and pay, and reverting to the former system of an extra day's pay per month. On the 26th of July, however, the matter was again considered by the Committee, and it was agreed that in future one week's holiday per annum, with pay, be granted to each of the lighters, but that the holiday should be granted to only one man at a time in each section, and that the work of the absentee should be performed by the lamplighters on duty in his section. This arrangement will come into force next summer.

The work of lamplighting is carried out by 14 foremen and 183 lighters; the average number of lamps dealt with by each lighter being 111 in the city and 90 in the suburbs. From the 15th of May to the 31st of July in the city, and from the 1st of May to the 15th of August in the suburbs, the lamps are lighted at the lower rate only; the midnight visits for reduction not being made. In lieu of this, each lighter is employed for five days on lamp painting; and by this means one-third of the lamps and columns in the city are annually overhauled and painted. The entire maintenance of the columns, brackets, lamps, and fittings is undertaken by the Gas and Lighting Department, and the following (among other) work was carried out by 70 mechanics, &c.; the figures for 1905 being given for comparison:—

	1905.		1906.
On district—			
Columns fixed	177	..	140
,, reinstated	165	..	118
Lamps repaired	5,156	..	5,631
,, reglazed	15,887	..	18,684
,, changed	2,469	..	1,115
Visits paid by trimmers to incandescent gas-lamps	273,991	..	284,482
In workshop—			
Lamps repaired	4,267	..	3,391
,, reglazed	3,130	..	2,912
,, manufactured	37	..	25
In stores—			
Incandescent gas-burners cleaned, repaired and adjusted, &c.	4,610	..	4,788
New incandescent gas-burners adjusted only	1,543	..	2,134
Incandescent gas-burner chimneys cleaned	231,567	..	238,688
Regulators cleaned, adjusted, &c.	12,867	..	15,687
New regulators adjusted only	1,615	..	5,875

During the past year there were 228 accidents to street-lamps, and in 135 cases the police were able to ascertain the names and addresses of the owners of the vehicles causing the damage, and accounts to the value of £125 13s. 5d. have been rendered.

On the subject of gas-meter testing, the Superintendent expresses his pleasure at being able to report that this department of his work was self-supporting last year. The expenditure amounted to £437, while the fees reached a total of £446 7s. 9d., against £383 13s. 6d. in 1905, which was a record year; while the average for the last ten years amounts to only £270 4s. 6d. The following figures will show the extent of the year's work:—

	Gas Company's.		Sundry.		Prepayment.
Meters certified	8965	..	406	..	924
,, rejected	120	..	291	..	245
	9085	..	697	..	1169

The grand total is 10,951, compared with 9591 in 1905.

The work of testing for illuminating and calorific power, purity, and pressure the gas supplied by the Gas Company was carried out continuously during the past year. In addition to the ordinary tests, the Committee sanctioned one for the presence of carbon monoxide, as indicating the extent of the admixture of carburetted water gas. The statutory illuminating power of the gas is 20 candles when measured by a batswing burner, consuming 5 cubic feet of gas per hour; the burner in use being a No. 7 steatite batswing, approved by the Metropolitan Gas Referees. The gas is tested daily at the office; and, by arrangement with the Gas Company, the Examiner is empowered to test also by the portable photometer in any part of the city without notice. The results of the tests are as follows: Average illuminating value at office, 20·63 candles; in district, 20·46 candles. The gas is tested daily in the office for its calorific value by means of a Simmance-Abady calorimeter. Altogether 267 tests were made, showing an average of 788·15 B.Th.U per cubic foot gross, against 713·72 B.Th.U. per cubic foot last year. The Superintendent says this may be considered satisfactory. The average of 27 tests for carbon monoxide was 12·37 per cent.; indicating an admixture of 26·54 per cent. of carburetted water gas. The purity tests were satisfactory, and those made for pressure showed evidence of equable distribution.

On the subject of carburetted water gas, the Superintendent reports that, acting on the instructions of the Committee, he obtained, through Dr. Brislee, of the Liverpool University, 30 tests of the gas supplied throughout the city; from which it was ascertained that, in the south end chiefly, the gas contained an excessive admixture of carburetted water gas. Upon this report the Health Committee appointed a deputation to wait on the Board of Trade for the purpose of urging legislation with a view to the adoption of the Departmental Committee's recommendation, especially with regard to the maximum amount of carbon monoxide; and the Lighting Committee were invited to join. The Local Government Board were subsequently approached to receive the deputation, which, however, they declined to do; stating that no useful purpose could be served by such an interview.

The Superintendent reminds the Committee that at certain periods of the year great difficulty is experienced in obtaining a sufficient supply of gas to the street-lamps, owing to the deposition of naphthalene, which frequently has the effect of extinguishing the lamps, or reducing the supply to such an extent that the light obtained is useless for illumination. During the past year the Department received 9514 reports of such failures, against 8082 in the previous year. Nearly the whole of these stoppages were in the lamp-fittings, and were therefore attended to by the Corporation's own fitters; the remainder being dealt with by the Gas Company, as the obstructions were in their service-pipes. The Superintendent forwards each month to the Company a statement showing the number of failures; and he is assured by their Engineer (Mr. Edward Allen) that all possible steps have been taken to minimize the trouble, which is one that affects every gas undertaking.

At the close of the year, the Superintendent devised a new type of lamp for street incandescent gas lighting, which it is expected will reduce the maintenance charges. It is storm-proof, and as the lamp-cock is placed inside the lamp, it is confidently hoped that the troublesome naphthalene deposits will be reduced to a minimum. The Committee agreed to pay the fees in connection with patenting this lamp, on the understanding that the Superintendent would allow the Corporation the unrestricted use of it for all time in Liverpool. [An illustration of the lamp will be found on p. 543.]

The total charges in connection with the public lighting of the city and the supervision of the gas supply for the year amounted to £50,275, and a revenue of £3190 was derived from work, charged to other departments and bodies, which includes a large portion of the gas-fitting work of the Corporation; making a net expenditure of £47,085, against £48,566 in 1905.

INCANDESCENT GAS LIGHTING IN SCHOOLS.

At the Meeting of the Education Committee of the West Ham Corporation on Monday last week, the Architect presented a report (which was adopted) in regard to certain questions which had been raised as to the incandescent gas lighting in the public elementary schools of the borough. In the course of it, he made the following remarks:

In consequence of the bye-passes being kept alight during the day (and, I believe, in some cases during the night also), apart from unnecessary use of gas, the bye-pass lights were frequently blown out, owing to the practice in many of the schools of throwing the windows wide open, even during high winds; thereby causing a smell of gas throughout the schools. This difficulty had not arisen in the earlier schools fitted up with the incandescent light; and as I found it would take some time to find a remedy, I judged it expedient temporarily to close the bye-passes until the teachers and caretakers had acquired more experience with the new lights. The bye-passes are being gradually re-opened. The cost of closing the bye-passes varied from 3s. 6d. per school upwards; the average cost working out at 15s., and the total cost to about £25. The additional cost of fitting the bye-pass part of the burner varied up to as much as 9d. each, according to pattern of burner; and had they been entirely omitted a saving on the whole of the Council's schools of approximately £85 might have been effected. These bye-passes, I am informed, can be regulated under favourable conditions to consume as little as 1-30th of a cubic foot of gas per hour; but those in the schools were rated to burn from 1-10th to 1-8th of a cubic foot. The consumption of gas by the burners used in the schools varies from 4 to 10 cubic feet per hour, according to pattern—the average throughout the schools being about 4½ cubic feet; consequently 40 minutes of the full burner is equivalent to 24 hours of the bye-pass. Though in many cases, and in awkward situations, it is not unusual to keep the bye-passes burning continuously, the proper use of them in school lighting does not contemplate their being alight all the time. They should be lighted on foggy mornings, before the afternoon session, when it is dark before school closes, for use in the evening for school cleaning, and for occasional use of the rooms in the evening. An average of two hours per day for 120 days fairly represents the amount of lighting of this exceptional character, during a season involving a gas consumption by the bye-pass of 30 cubic feet. If bye-passes were not fitted, the ordinary burners would have to be alight for probably fully one-half of this time, involving a consumption of not less than 540 cubic feet. There is, therefore, or should be, a saving by using the bye-passes in a single quarter sufficient to more than pay for the extra cost of fitting, in addition to the great convenience they afford. On the other hand, the unnecessary burning of the bye-passes may involve a considerable consumption of gas where, as in the schools, there are a large number in use.

While on the question of gas consumption, I may mention that in 35 of the Council's schools fitted with incandescent gas there was a reduction in the gas consumed for the quarter ended Christmas last, as compared with the last quarter of 1905, of nearly a million cubic feet (975,100 cubic feet), and this notwithstanding that there has been one more night school this winter, and that there were during the summer numerous additions to the gas-cooking appliances fitted in the schools;

while throughout the schools there is a greatly improved light. There is an increase of 18,100 cubic feet at Three Mills, and 18,800 cubic feet at the Maryland Point Schools, which seems, in comparison with other schools, to need some explanation. A return shows that 252 mantle protectors were broken before they were used for school purposes—*i.e.*, before they were required to be lighted up during school hours. This number included the whole of the 13 non-provided schools and the seven Council schools fitted previous to the last summer, which had not been overhauled for the winter season. Except at the Three Mills School, where 49 are stated to have been broken, and the Hermit Road School, where there were 28, the number of breakages per school was insignificant. Of breakages after gas lighting was resumed for school purposes, the number returned is 1033. This included the 13 non-provided schools and five schools previously fitted; and the total number of burners to which this number of breakages refers is between 7000 and 8000. There are six schools where the breakage was abnormal—these schools accounting for nearly two-fifths of the total breakage; whereas at the remaining 50 schools it was comparatively slight. This abnormal breakage I attribute partly to the fact that the windows were open a great deal while the gas was alight, causing a great amount of cold air to impinge on the hot glass, and partly to there having been too much gas passing through the burners, causing undue heat. These six schools are among those in which there has been the largest reduction in the gas consumed, as they were all fitted originally to burn 60 cubic feet per hour per class-room, as against the present fittings consuming from 24 to 30 cubic feet; and, consequently, when the gas was turned full on at the main cock there was too much pressure. The ground-glass protectors used in the first instance do not appear so well able to stand the extreme and rapid change from heat to cold as the clear-glass ones now being used, though the clear glass does not give so good a light as the ground glass. There must necessarily be a little risk to the children where glass is used overhead, and for this reason I have hitherto avoided using fittings needing glass. The risk, however, I consider is very slight. The important point in school lighting is that the light shall be as evenly distributed as possible; and the London Education Committee's rule, I am informed, is that no child shall be more than 6 feet (recently altered to 5 feet) away from a light. In the Council's schools, the dispersion of the lights has not been carried to so great an extent as this; and with the Jena clear-glass protectors now being used, I think the risk will be reduced to a minimum.

WATFORD AND THE GAS SUPPLY OF RICKMANSWORTH.

A good deal of what one member termed "carping criticism" was heard at the meeting of the Rickmansworth Urban District Council last Thursday week, when the Gas Committee reported that they had considered an offer by the Watford Gas Company to supply them with gas in bulk, but regretted that at the present moment they were not in a position to entertain it.

Mr. Taylor, in reply to a question as to whether the Committee had made many inquiries as to the terms on which Watford were prepared to supply gas in bulk, said the Committee had considered the matter very carefully, and came to the conclusion that the present was not an opportune time to entertain the application. They were developing new plant, increasing their output, and reducing the cost of manufacture; and the quality of the gas was superior to that supplied at Watford. He did not think Rickmansworth people would like to put up with 14-candle power gas, such as they had at Watford; and he could see no object in taking a supply from the Company. Mr. Couchman, who had put the question, remarked that the explanation was not satisfactory to him. He looked upon the suggestion, which came voluntarily from the Watford Gas Company, as the only possible hope of escape from the intolerable position in which they found themselves. He would propose that the matter be referred back to the Committee, with instructions to approach the Watford Company. The amendment was seconded by Mr. Oddie; and Mr. Kennedy, in supporting it, said they had a most uncomfortable millstone round their necks, and he thought they should lose no opportunity of getting rid of it. Mr. Ibbotson contended that to get gas in bulk from a neighbouring Company would be a step in the wrong direction. Their difficulty was not in making gas, but in meeting loans and interest. The purchase of gas from Watford would not help them a bit. Rickmansworth should manage its own affairs. To go to Watford would mean the loss of considerable labour in Rickmansworth.

Replying to these remarks, Mr. Taylor said that great injury was being done to the undertaking owing to these continual depreciations of the Council's property. They were turning a difficult corner; but some individuals seemed to think they were going to gain favour with the public by depreciating the value of their property. He did not like to say how he should characterize such conduct. To continually cry "stinking fish" was a very bad policy; and to keep saying that they had got a very bad egg, was most unwise. They might think he was an optimist; but he was not. He had looked into the matter most carefully; and some of the wisest men on gas matters in the country said the undertaking could and ought to be run at a profit. He was therefore not prepared to accept the views of a few irresponsible people who knew nothing at all about gas manufacture, in the face of the opinion of eminent experts. They said that under proper management the undertaking ought to go forward. They had just got rid of one of their most serious hindrances; and now they were able to breathe freely, and would, he believed, go forward. What they needed was not hostile, adverse, carping criticism, but efficient help to carry on what ought to prove a profitable thing for the town.

Mr. Coutts said, assuming the gas-works were such a millstone, how did they suppose purchasing gas from Watford was going to get rid of it? Did they contemplate that Watford would take over the whole concern and pay them the money they had spent on it? Mr. White pointed out that the feeling of the people was that if Watford could supply gas at 2s. 8d. per 1000 feet, it was strange that Rickmansworth could not manufacture it for less than 4s. 6d. Mr. Franklin believed that Rickmansworth would be able to manufacture gas much cheaper when they had a fair chance; but Mr. Kennedy still maintained that the proposal from Watford, which, he said, might enable them to extricate themselves from the quagmire into which they had got, ought not to be passed over in an off-handed manner. He thought they should be quite prepared to meet anybody who was prepared to relieve them of their burden. The fact that a person had been able to deceive the very elect up to the last moment was enough to condemn the whole management of the concern. He was not at all inclined to endorse Mr. Taylor's complacent view of the circumstances. The Chairman (Mr. C. Barton-Smith) said that personally he did not think the gas concern was so bad as had been represented. He did not see any hope of relief or any good likely to come from any correspondence with the Watford Gas Company. He did not understand how their offer to supply Rickmansworth with gas at a low figure was going to help them in connection with the undertaking.

Only three members voted for the amendment, which was lost.

GAS AND ELECTRIC LIGHTING IN NEW YORK LAST YEAR.

Second Report of the State Commissioners.

The New York Commission of Gas and Electricity have lately presented to the Legislature their second annual report, dealing with the matters which came within their jurisdiction in the twelve months ending Dec. 31 last. According to an abstract of the report in the "American Gaslight Journal," the most important recommendations refer to questions of procedure. As the statute regulating the work of the Commission now stands, complaints can be made to the proper municipal authorities by 100 or more consumers of gas or electricity in the territory of the corporation complained of. The Commission recommend their amendment so that complaint may be made by 25 customers in the territory served, where it contains less than 1000 population, by 50 where the population is between 1000 and 5000, by 75 where it is between 5000 and 10,000, and by 100 in all other places. The Commission further recommend an amendment which will require a company incorporated before the law came into operation to obtain the consent of the Commission before exercising powers under a franchise hereafter obtained from the local authorities. Such companies are now free to invade the territory of established companies without first securing this consent. Further recommendations are the following: That power be given to the Commission to revoke all certificates of authority to transact business where the construction of the plant in question is not begun in good faith within a certain period from the date of issuing such a certificate; and that owners of municipal gas or electric plants should be compelled to make annual reports to the Commission. Attention is called to the fact that no provision is made, upon the application of a company, for a revision of prices after the expiration of three years for which the price is fixed. The Commission consider it to be only fair that a company should have the same right as the consumers to apply for a revision of the price fixed by it, as changing conditions might increase the cost of production and distribution.

The report shows that there are 426 corporations, municipalities, and individuals furnishing gas or electricity for light, heat, or power in the State coming under the supervision of the Commission. The capital aggregates $456,000,000, and the gross income approximates $75,000,000 per annum. During the year ended Dec. 31 last, the Commission had before them 74 applications, upon all but three of which public hearings were held. During the year, the applications of 29 companies for certificates of authority for consent to issue stocks or bonds, and for consent to increase issues of stock or bonds, were considered by the Commission. The capital asked for aggregated $9,492,000; while the sum allowed by the Commission was $6,837,000—a reduction of $2,655,000, or approximately 28 per cent. In reducing the amount of stock and bonds applied for, the Commission followed their policy of requiring each company applying for consent to make such issues to furnish them with a statement in detail as to the purposes for which the proposed issue was to be used. In no case did the Commission allow an issue except for actual improvements and extensions to plant. In the past twelve months, the Commission received complaints as to the price and quality of gas or electricity from Albany, Buffalo, Rochester, Watertown, Mount Vernon, and Nyack. Complaints were filed with the Commission prior to Jan. 1, 1906, against the Consolidated Gas Company of New York and the subsidiary Companies, and the Brooklyn Union Gas, the Syracuse Lighting, the Plattsburgh Light, Heat, and Power, the Lozier Light, Heat, and Power, and the Auburn Gas Companies. The report reviews the results accomplished by an investigation of the complaints. Reductions in the price of gas were made in 14 cities and towns in the State, and in the price of electricity in more than 30 places. The quantity of gas sold to consumers and for public lighting in 1906 was 39,858,755,381 cubic feet, against 37,914,016,000 cubic feet in the preceding year—an increase of about 5 per cent.

The report shows that although gas for illuminating purposes has been supplied in the State since 1823, no regular or systematic inspection or examination has been made of the purity and illuminating value of the product supplied, except in New York City, until the past year, when the Commission established a department for these purposes. Tests were made in practically every section of the State; and the results showed the candle power of the gas furnished to be very low. An order has been issued by the Commission compelling all companies furnishing annually 15 million cubic feet of gas and upwards to instal an improved photometer for use in making frequent tests of illuminating power. In the course of the year, 350,158 meters were inspected and sealed by the State Inspector. Of this number, 5548 were private meters, 1446 of which were found to be fast, 883 slow, and 3219 correct. The Commission received reports of 540 accidents, of which 439 were slight and 101 serious, and 28 of them were fatal. The Commission has notified the various companies that they have under consideration a preparation of a uniform system of book-keeping; and they have invited them to furnish a classification of accounts employed and to offer suggestions.

SYDNEY (N.S.W.) WATER SUPPLY.

The Cataract Dam.

In a recent number, "Engineering" had an illustrated description of the Sydney Water Dam—the largest of its kind in the southern hemisphere—which is expected to be finished in the course of the next few months. It is situated within the watershed of the Prospect reservoir, which for about twenty years has been the source of the water supply of the city of Sydney; and it has been constructed to supplement the storage. Occasionally, for some years past, and especially in 1902, severe droughts have occurred, and the reservoir became dangerously low. Owing to this, and to the concurrent steady increase in the population of the city and suburbs, serious shortage of water was feared; and though the inhabitants were never reduced to a limited supply (except occasionally for watering gardens), it was felt that, in view of the future, more of the water escaping during the rainy years must be impounded.

The water supply of Sydney is derived from the Nepean and Cataract Rivers. The catchment area of 354 square miles, with the good rainfall which is characteristic of the coastal districts of New South Wales, is ample for the requirements of the city, even supposing enormous expansion. But the existing storage at Prospect (only 5502½ million gallons by gravitation) is quite inadequate; and, further, as the water from the rivers mentioned is conveyed to the reservoir by a system of canals and tunnels, having a daily capacity of only 150 million gallons, the storm flow of the rivers cannot be fully utilized.

For many reasons, the original dam could not be raised. The plan, therefore, was adopted which has been so successfully carried out in the New York supply, where the Cross River dam was recently built within the watershed of the new Croton dam reservoir—but at a much higher level. In order to increase the storage, a masonry and concrete dam is being erected on the Cataract River; and in this way the storage capacity of the Prospect dam will be increased by no less than a possible 21,412 millions. The site is highly favourable for such a work, as will be judged by some of the following figures, which give the main dimensions.

	Feet.
Length of dam	811
Height above river-bed	154
Depth below ,,	40
Top width	16
Bottom width	158
Maximum depth of stored water	147

The area covered by water is 2145 acres. The work originated in the recommendation of a Royal Commission appointed in March, 1902; their proposal being submitted to the Parliamentary Standing Committee on Public Works, who reported favourably in July, and the Act of Parliament authorizing construction followed on Oct. 28 of the same year. Operations were at once put in hand, and the dam was commenced under day labour; but a Ministry more favourable to the contract system having come into power, the work remaining to be done in April, 1905, was let to a contracting firm, the plant on hand being transferred to them, and the date of completion stipulated to be April 10, 1907.

The body of the dam is composed of cyclopean rubble masonry, consisting of blocks of sandstone weighing from 2 to 4½ tons, built to break joint both vertically and horizontally, and to have a maximum of bond. The stones are bedded in cement mortar, and the vertical joints are made with concrete. The proportion of blocks to concrete and mortar is approximately as 65 : 35. The up-stream face consists of concrete blocks, 5 ft. by 2 ft. 6 in. by 2 ft., set upon, and jointed with, special cement mortar, and backed by an average of 3 feet of basaltic concrete. The down-stream face is made of concrete, 6 feet thick. Reinforced concrete is used in the construction of the valve-chambers at the base of the dam.

A bye-wash to pass surplus flood, with a weir 730 feet long, is provided. The top of the latter is about 150 feet above the river bed; the overflow water joining the river about one-eighth of a mile below the dam. The top of the dam is 7 feet higher than the top of the bye-wash weir. Two 48-inch pipes with valves, communicating with outlet-wells and sluice-valves in the up-stream face of the work, will form the permanent outlet; but two additional 48 inch pipes, making four in all, are provided to pass the river flow during construction. The valve-house on the down-stream side of the dam is roofed with ferro-concrete, to provide against damage by water topping the work during construction; and the contracts provide that the valves shall be left open till the lowest portion of the wall reaches a level of approximately 80 feet above the river bed.

In connection with this provision, a remarkable coincidence, which resulted in the discharge of an enormous volume of water over the dam, occurred. An exceedingly dry period of fifteen months' duration resulted in the depletion of the city supply; indeed, so small was the flow of the river during this period that one 48-inch pipe more than sufficed to carry it off. An arrangement was accordingly made with the contractors that the valves should be closed, and water, if any, impounded on Aug. 30 last. Two days previously, work was being concentrated upon the lowest portion of the wall, then 76 feet above the river bed—the gap being about 65 feet in width. The 29th was showery; and on the 30th, at 5 p.m., the valves were closed. At 6 p.m. the same day, after fifteen months of dry weather, heavy rain—amounting to 10 inches—fell in the catchment area; and by 6 o'clock a.m. on the following day the water was flowing over the dam to a depth of 16 feet in the gap—the lake above the dam holding at the time approximately 2000 million gallons. The engineers opened one of the 48-inch valves to reduce the surcharge; but it was not considered advisable to open the other three, on account of the vibration likely to result from the high velocity, as the fixing of the valves was not completed. Rain ceased on the 31st of August, and on the 3rd of September the discharge from the open valve and over the wall had reduced the level of the lake to that of the top of the wall—viz., 76 feet—when the valve was partially closed and work resumed. No damage was done to the structure, though one or two blocks of sandstone which had not set were carried from the top of the wall, and struck the roof of the valve-house in falling.

As regards the general plant, the power-house supplies three units of 65 kilowatts, working 14 electric motors varying from 8 to 40 H.P. Two electrically operated Lidgerwood cableways, each having a span of 1100 feet, handling 4½-ton loads, are erected above the dam. The towers of one set are stationary, and the other traversing—their height being 57 feet. Special Lidgerwood electric hoists are provided, with double drums 53 inches in diameter, operated by two direct-current motors, designed for 500 volts, and provided with series parallel controllers. The hoists have a maximum speed of 1200 feet per minute. There are six 4-ton cranes driven by electric motors, and six travelling steam-cranes—four of 10 tons, one of 5 tons, and one of 3 tons capacity. There is also a complete concrete-mixing plant. At the quarry supplying the broken stone, there is a crusher producing 40 tons per hour; a revolving screen separating the metal into different bins.

The estimate for the dam was £341,650; but the cost is expected to be only about £325,497, of which £235,996 is for the concrete used. Mr. L. A. B. Wade, M.Inst.C.E., the Chief Engineer for Rivers, Water Supply, and Drainage, is responsible for the design and execution of the structure. He has been assisted by Mr. E. M. de Burgh, M.Inst.C.E., of the same department, who has the principal charge of the work; and Mr. J. Symonds is the Resident Engineer.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Last night Mr. A. Wilson, the Engineer and Manager to the Gas Department of the Corporation of Glasgow, delivered a popular lecture upon "Gas and its Uses," in the Blackfriars Parish Church Hall, in the Dennistoun district of Glasgow—Bailie Wallace presiding. There was a large audience. As may be supposed, being one of a series promoted by the Corporation, the lecture was of an educational nature, dealing with the most up-to-date appliances in which gas is used, and making it clear to the public how they may get the best value from the gas in lighting, cooking, and heating. Afterwards a number of slides were shown of the plant at Provan, the working of which was described.

The Corporation of Greenock have remitted to a Sub-Committee to prepare a draft Provisional Order, which they propose to make application for next November, and in which, among other things, they are to ask for powers for the differentiating of the price of gas.

The following have been selected as a short leet for the post of Manager of the Corporation Gas-Works at Kirkintilloch, which is about to become vacant by the transference of Mr. W. Wilson to Falkirk: Messrs. J. Baxter, Forfar; J. Bell, Airdrie; W. Kellock, Kilsyth; J. M'Leod, Glasgow; H. G. Ritchie, Kirkcaldy; H. Rule, Falkirk; J. Stewart, Lanark; and J. Wynne, Carnoustie.

At a meeting of the Kilmarnock Town Council last week, the Gas Committee reported that they had considered the report of a Sub-Committee appointed to consider proposals for the letting out of gas-heating appliances; and that they had unanimously agreed to recommend: (1) That gas-fires, radiators, and heating-plates, at a net cost of from 17s. 6d. to 50s., be hired out at an annual rental of 10 per cent. on net cost, and above this value at 15 per cent.; (2) that fires, &c., under 17s. 6d., and all over £5, be sold only and not hired; (3) that if a consumer desires to purchase the fire within a period of two years from the date of hire, the full sum paid for hire be credited to the purchase, and after two years 50 per cent. only of that sum; (4) that in future all fires and cookers be fixed free (the present practice being to fix cookers up to 6 feet of piping); (5) that all hires be paid in advance. This minute was adopted by the Council without comment, and is already in operation.

Complaints about gas not giving sufficient light are common; complaint about its giving too much light is unique. Yet this is what a statement by Sir Robert S. Ball, the celebrated astronomer, made in a lecture in Edinburgh the other evening, amounts to. A few years ago a Mr. Anderson, of Edinburgh, came prominently before the public as the discoverer of a new star. He had on more than one occasion previously distinguished himself in the same line—a circumstance which indicated an exceptional amount of vigilance in watching the celestial bodies. As a matter of fact, Mr. Anderson spent a great part of the hours of darkness in his own garden, keeping a look-out upon the heavens. The statement of Sir Robert Ball was to the effect that he had discovered that Mr. Anderson had had to leave Edinburgh for a reason which was very creditable to the authorities—that the streets were now as light at night as during the day, and that the city was unsuitable for astronomical observers. It is very flattering to the Corporation of Edinburgh to be told by so eminent an authority that their efforts to improve the street lighting of what was, till quite recently, regarded as one of the worst-lighted cities in the United Kingdom, have been so successful. We must sympathize with Mr. Anderson in being driven away to pursue his favourite enjoyment amid less happy surroundings, even though the reason be a good one.

Somewhat of a sensation has been created in Dundee by the action of the Auditor of the water accounts of the city for the past year, in ordering a surcharge upon the Convener of the Water Committee—ex-Provost Ballingall—of £24 of the costs of the inspection by the Committee at Lintrathen last June. The Auditor—Mr. J. C. Robertson, C.A.—in an interim report to the Water Treasurer, says that of the total sum of £104 he disallows £24; and he orders this sum to be paid to the Treasurer by the Convener within one month, reserving to the Convener all claims competent to him for relief against the other members of the Committee. In a note to his order, the Auditor says that he has repeatedly requested the Engineer to impress upon the Convener the necessity of restricting the numbers invited and the expense incurred at the annual inspection, with an intimation that he would be obliged to disallow what he considered unwarranted expense; that a special warning was given prior to the last inspection; but that, in deference to use and wont, he has allowed this time for more outside official guests than he will be prepared to do in future. The persons invited were all the Water Commissioners, along with past Conveners, Lord Provosts and Provosts of the city, the four Conveners of the Harbour Trust, the Sheriff, two members of the Dundee Chamber of

Commerce, the factors on the Airlie estate, the parish minister of Lintrathen, and the head officials of the Corporation departments; the total number present being 60. On being interviewed upon the subject, Mr. Ballingall said that the list of guests was not drawn up by the Water Committee, but by a Committee appointed by the Water Commission as a whole, and that it is his intention to pass the order for surcharge on to the Lord Provost, as the Chairman of the Commission. When the arrangements for the inspection were being made, Mr. Johnston, one of the Commissioners, objected to the expense which was being proposed, and moved that it be restricted to £50; but he was not supported, and the previous practice was followed. He has been in communication upon the subject with the Lord Advocate—Mr. T. Shaw, K.C.—who has written to him that the provisions for auditing the accounts are those contained in the various Acts dealing with the Dundee water supply, and, that being so, the provisions under which the Secretary for Scotland acted in the case of the Blairgowrie special water district do not apply to Dundee, but that the question of the legality of particular charges is primarily one for the determination of the Auditor of the accounts. The feeling is prevalent that the Dundee Water Acts do not give the Auditor power to surcharge, and that all he can do, in the absence of statutory power, is to call attention to the facts, and state his objection to any charges he might consider unauthorized and objectionable. It is probable, therefore, that the order for surcharge will be repudiated by the Water Commissioners.

The Corporation of Arbroath are finding difficulties to thicken upon them in connection with their scheme for the introduction of a gravitation water supply. This week, in the Court of Session, application was made on behalf of the Earl of Southesk, the Earl of Dalhousie, and a firm of salmon fishers in Montrose, to have the Corporation interdicted from abstracting water from the Noran stream until they have completed their compensation reservoir at Glenogil, and are sending down the quantity of compensation water which is fixed by statute—not less than 625,000 gallons in the course of 24 hours. The application is made in respect of injury to salmon fishings. The Corporation, it is said, in October, 1905, applied to the Fishery Board for permission to take a small quantity of water; but the request was declined. Notwithstanding this, it is asserted, a large quantity is being taken. It is pointed out that the River South Esk is peculiarly devoid of tributary streams, its main tributary, and most important source of supply, being the Noran, and that the water of the Noran, being very pure, mitigates the sewage discharges in the lower reaches of the river, but that the actions of the Corporation are, in great measure, depriving the complainers of this benefit. The complainers reserve all claims of damage occasioned by the actings of the respondents. Lord Guthrie on Tuesday ordered the application to be served upon the Corporation, and allowed them five days to answer it. Answers have not yet been lodged; but the Town Clerk has been instructed to communicate with the agents for the complainers, which looks as if it were the intention of the Corporation to endeavour to come to terms with the complainers.

The water supply to Loanhead, in Midlothian, was turned on on Wednesday, after the relaying of the mains. A hundred and twenty years ago water was brought in, in iron pipes, from the eastern portion of the Pentland Hills; and the present is the fourth augmentation which has been effected since then. On this occasion, a 3-inch main has been lifted, and a 5-inch one laid. The work has cost about £1500. Mr. Somerville Carfrae, C.E., of Edinburgh, was the Engineer. The ceremony of turning on the water was performed by Mrs. Kerr, wife of the Provost of the place. After the ceremony, a cake and wine banquet was held in the Masonic Hall in Loanhead.

Quality of Leeds Gas.

Judging from an article which appeared in the "Yorkshire Post" a few days ago, Leeds is in for an agitation regarding the candle power of the gas. It is remarked that, "whatever may be the ultimate blessings of the lower grade of gas supplied by a beneficent Corporation, it is beyond dispute that the present is a period of great trial and tribulation to Leeds householders, and particularly to those living in some of the suburban districts of the city." This, of course, refers to the fact that Leeds has joined in the prevalent view that modern appliances have rendered high-candle power gas unnecessary. The illuminating power was formerly 18 candles; but now the Corporation are authorized to supply gas of 14-candle power. The Corporation, however, decided not to take full advantage of their powers, but to keep the gas as nearly 15 candles as possible. On this point, the "Yorkshire Post" says: "Since the reduction in price a few months ago, we understand that the quality has never been under the wretched minimum allowed by the Act, though it has on a number of occasions been below 15 candles—the standard which the public have been led to expect from a considerate Committee. Surely, it ought not to be impossible to always maintain it at 15-candle power." In the course of investigation, our contemporary has discovered that "the municipalization of gas-works does not necessarily mean a cheaper commodity than that which a company can supply;" and some interesting comparisons between Leeds and Sheffield are made. The Newcastle-on-Tyne and York Gas Companies are also quoted as examples of excellent management.

Yarmouth Town Council and the Water Bill.—The Yarmouth Town Council have, by a large majority, decided to oppose the Great Yarmouth Water-Works and Lowestoft Water and Gas Bill. In moving the resolution to this effect, the Deputy-Mayor remarked that it was only a sense of duty that placed them in opposition to men so esteemed as the Directors of the Water Company in regard to the Bill, which in the main seemed to be the old Bill that the Corporation had to defeat last year at the heavy expense of £3000. The Company thought there was no other source than the river; but Parliament had not granted power for a river source of supply for thirty years. Some clauses had been introduced in the new Bill as safeguards; but these seemed of little value.

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CURRENT SALES OF GAS PRODUCTS.

Week ending Feb. 23.

There is little alteration in tar products so far as London is concerned. Large inquiries for pitch continue to be received; but makers are well sold, and disinclined to quote ahead just now. 90 per cent. toluol is very firm; but benzol is hardly so strong—the latter being quoted 11½d. to 11¾d. per gallon. 60° crude carbolic is 1s. 8½d.; but crystals are a shade easier. Sulphate of ammonia is still rather disappointing. Deliveries are being well taken; but prices remain quiet—being on Beckton terms £12 2s. 6d. to £12 3s. 9d. for this and next month.

LIVERPOOL, *Feb.* 23.

Sulphate of Ammonia.

The market has been somewhat inactive during the week, and the tone at the close is rather quiet with a slight reduction in prices, which are £11 17s. 6d. f.o.b. Hull, £12 f.o.b. Liverpool, and nominally £12 1s. 3d. to £12 2s. 6d. f.o.b. Leith. There have been comparatively few parcels placed upon the market, and, although these realized previous values, there has been a scarcity of new orders, and an absence of any haste to complete February requirements. Next week will show what these are; and meantime an amelioration of the weather conditions should give some stimulus to the market. An important feature in the situation is that there are practically no parcels offering for delivery at Leith, all the oil makes in the North being evidently very fully sold. In forward delivery, no first-hand business is reported; the ideas of buyers and producers being still too divergent.

Nitrate of Soda.

This article is steady at 11s. 6d. per cwt. for ordinary and 12s. for refined quality.

LONDON, *Feb.* 23.

Tar Products.

Markets have been quiet during the past week, and there has been very little alteration in values. There is no change in pitch. It is still possible to buy at about 25s. on the east coast and 24s. on the west coast for delivery this side of June; but regarding September-December, manufacturers at present refuse to quote, as they believe they can do no harm by waiting. No orders are obtainable on the Continent for prompt delivery except at very low figures; while for forward, the prices indicated by buyers are just now far too low to induce dealers to sell. The demand for creosote continues very firm indeed; and, though second-hand oil could be purchased in London at fairly low prices, London manufacturers are well sold and very firm in their ideas, and would not consider anything under 2¼d. per gallon. In the Midlands, it is reported that 2⅜d. has been offered and refused; manufacturers holding out for 2½d. In the North, business has again been done at 2d.; but the majority of manufacturers are well sold, and will not entertain any business at under 2⅛d. Benzol, 90 per cent., is very quiet. Business has been done at 8d., naked, at manufacturers' works in the Midlands; while sales are reported at under 10½d. on the east coast. In London, manufacturers would probably accept 11d. for prompt delivery, at which price it is said that country makes have been sold in this district. There is very little offering in 50-90 per cent., which is firm. No business is reported in toluol, which is scarce; manufacturers being well sold, and not inclined for further business except at good prices. There is no alteration in the market for carbolic acid, and manufacturers refuse to accept the prices offered. There is no change in the position of crystals. The smaller makers appear well sold, and not disposed to quote for any further quantity just at present; while the larger makers report that they receive orders from time to time at the current market quotations. The market for solvent is quiet. Business has been done upon the east coast at 1s. 1½d. In London, it is improbable that business could be done at anything under 1s. 4d. to 1s. 4½d.; while for the finer qualities very good prices are reported to have been paid. In anthracene, some quantity was sold in London recently at 1½d. per unit.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 25s. 3d. to 25s. 6d.; east coast, 25s.; west coast, 23s. 9d. to 24s. 6d. Benzol, 90 per cent., 10d. to 11d.; 50-90 per cent., 11¼d. to 11⅜d. Toluol, 1s. 1½d. to 1s. 2¼d. Crude naphtha, 4⅞d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅛d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2½d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8⅝d. Naphthalene, £6 to £10; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

There is no alteration in the market for this article. Outside London, makes could be secured at about £11 17s. 6d. on Beckton terms; but the principal Gas Companies, being well sold, are very firm indeed in their ideas, and refuse to quote anything under £12 5s. for February-June. In Hull, £12 has been offered and refused for one of the best makes; but inferior quality could be bought at £11 17s. 6d. to £11 18s. 9d. In Liverpool, business is reported to have been done at £12, and at £11 17s. 6d. for discoloured. In Leith, there is very little available, and dealers would no doubt pay £12 for prompt delivery.

Tynemouth Water Supply.—An arbitration has lately been held to determine the amount to be paid by the Tynemouth Corporation in respect of an easement for a line of pipes through the Netherwitton Estate of Mr. Trevelyan. The amount claimed by the owner was £4500; and this was duly supported by witnesses on his behalf. On the other hand, those for the Corporation considered that 1d. per lineal yard per annum was a fair rental value for the easement; and, basing their calculation on this figure, they estimated that £973 was sufficient compensation. The Umpire (Mr. Ernest Moon, K.C.) has awarded £1140 as the amount payable, with of £5 as compensation for damage to roads through the estate, if the owner can prove that he is entitled to it.

UNDISPUTED FACTS

Regarding the efficiency of the **"BLAND"** Light, the Chief Engineer and Manager of the Edinburgh and Leith Corporations' Gas Commissioners,

MR. W. R. HERRING, M.INST.C.E.,

writes:

"Adverting to your request that we should test the 'Bland' Inverted Gas-Burner, which you left at my Office about a week ago, I beg to inform you that we have now completed our experiments, and I am happy to be able to report that the results we obtain are fully equal to what is claimed in the circular, and that this Burner is undoubtedly one of the best on the market."

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The weather in this county during the last week has been severely cold. The coal trade continues firm at the full quotations of last week. House coal especially is in strong demand. The proposed eight-hour day in mines is regarded with disfavour. At a meeting of the Lancashire and Cheshire Miners' Federation, held in Manchester on Saturday, it was stated that a meeting of the Coal Conciliation Board had been arranged for Tuesday, March 5, to consider an application which had been made for a further 5 per cent. advance in wages.

Northern Coal Trade.

There has been a little ease in the coal trade of the North-east—due in part to the high prices that are asked being above what consumers readily give, and to the effects of the delay of steamers through the storms. In the steam coal trade, best Northumbrians are about 14s. 9d. per ton f.o.b., second-class steams 13s. to 13s. 3d., and steam smalls are steady at about 8s. to 8s. 6d. The collieries are, with few exceptions, working well; and some of them have sold their produce over a considerable part of next month, though sales over the shipping season are scarcely so heavy in amount as has sometimes been the case at this period. In the gas coal trade, there is a good demand, though it is rather showing signs of the falling off that is certain as the days lengthen. Prices of Durham gas coals vary, according to quality, from about 11s. 9d. to 12s. 9d. per ton f.o.b., but not much coal seems to be sold just at present, though small lots for export may be. The idea of buyers appears to be that expressed at the Newcastle Gas Company's meeting by the Chairman, that "prices might not be so unfavourable when the time arrived for purchasing." In the meantime, discussion as to possible prices continues; but it cannot be said to disclose new facts. In the coke trade, demand is steady, and prices are firm; so that gas coke has good support. Current prices for good gas coke vary from about 13s. 6d. to 14s. 6d. per ton, f.o.b., according to the shipping port.

Scotch Coal Trade.

The demand for all classes of coal continues strong, and is likely to be so for some time. There is great activity in the shipping line, though it was somewhat checked by the stormy weather of last week. The prices quoted are: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow, splint 12s. to 12s. 6d., and steam 11s. 6d. to 11s. 9d. The shipments for the week amounted to 255,135 tons—a decrease of 13,391 tons upon the preceding week, but an increase of 27,029 tons upon the same week of last year. For the year to date, the total shipments have been 1,774,562 tons—an increase of 264,155 tons upon the corresponding period of 1906.

The Charge for Water in London.

The Parliamentary Committee of the London County Council presented a long report, at the meeting of the Council last Tuesday, on the Metropolitan Water Board (Charges, &c.) Bill, in which a uniform charge for water of 5 per cent. on the rateable value of the premises supplied is proposed. A Special Committee had been considering the provisions of the Bill; and the Council were recommended to petition against it. The Committee found that the Bill in no way provides for uniform scales of charges, but merely fixes certain maximum charges, and leaves it open to the Board to make any charge within these limits. The "domestic purposes" charge is based on rateable value, and the loss caused by their new proposal is put at £10,000 a year. The Committee criticized the fact that baths capable of containing, when filled, more than 50 gallons of water are excluded from the "domestic supply." As the large majority of baths are capable of containing more than 50 gallons they would be excluded, and the consumer would derive no advantage from the new scale. The charges for trade purposes now in operation in five districts would be repealed by the Bill; and the Board would therefore be under no obligation to supply for these purposes. The Committee considered this obligation should be maintained. Except for public purposes (6d. per 1000 gallons), all charges are the maximum; and the Board may enter into agreements of any kind. The Council will petition against this Bill and also the Board's Various Powers Bill. The Holborn Borough Council will also oppose the Charges Bill. In the opinion of the Law and Parliamentary Committee, even if the percentage should be uniform, the charge for water would be different, owing to the rateable values in every borough varying according to the locality and the ideas of the rating authorities. Outside the county boundaries, it was not incumbent upon an Assessment Committee to make periodically new valuation lists; and in many parishes the valuations were far lower than they would be were this not so. Owing to this fact, many persons outside the county area would pay a lower rate for their water than those within the boundary. If the water-rate were increased to 5 per cent., as proposed, the Holborn consumers would pay between £5000 and £6000 per annum more for their water for domestic purposes than they do at present.

Haywards Heath and District Water Supply.—Last Tuesday, Mr. F. J. Willis, on behalf of the Local Government Board, held an inquiry at the offices of the Cuckfield Rural District Council into an application made by them for a Provisional Order forming the rural district of Cuckfield and the urban districts of Cuckfield and Haywards Heath into a united district for the purposes of water supply, and to empower the water authority to alter the rates to be charged for water to be used for domestic purposes. Mr. C. H. Waugh presented the case on behalf of the Joint Water Committee, after which Mr. S. T. Maynard, representing the Burgess Hill Water Company, and Mr. White, representing the East Grinstead Rural Council, made a few remarks. The Rev. F. S. Sclater asked that the position of Wivelsfield might be clearly defined in the Order, as between the Cuckfield Rural Council and the Burgess Hill Water Company the Chailey Council had been unable to act in the matter of providing Wivelsfield with water. The Inspector said the Board would see that the point was kept in view. There was no opposition to the application.



WHEN you are placing before a Consumer the advantages of a Gas Cooker, which make would you recommend his adopting?

Surely the latest, fitted with all this years' improvements, the result of much labour, thought and world-wide experience, and manufactured by the Pioneers of that particular business.

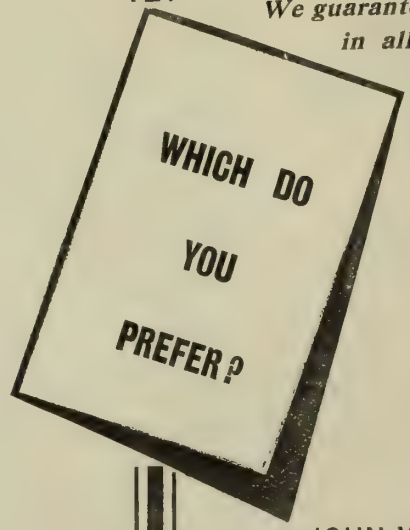
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We guarantee its Efficiency in all respects.



JOHN WRIGHT & CO.,
B'HAM.

Gas Explosion at Rotherham.

A gas explosion, which caused considerable damage to property, but fortunately no bodily injury, occurred at Rotherham last Tuesday week. The building that suffered most was the Reindeer Inn; but the house next door to it was also badly knocked about. Earlier in the day the presence of escaping gas had been detected in the latter; and the Gas Department were communicated with. On investigation, it was found that the cause of the trouble was a broken gas-main, which necessitated excavation. This work had been in progress three hours when the explosion occurred. The usual precautions had been observed. These included a request made to the occupiers of adjacent houses that they should have no fires or lights of any description in the houses until the escape was remedied, and that windows and doors should be allowed to remain open. Four or five men were working at the main, and had just found the breakage, when the explosion occurred. Immediately afterwards an examination of the Reindeer Inn showed that there were two fires alight, and some of the windows had not been opened. The accumulated gas came in contact, it is assumed, with the fires, and thus caused the explosion. The subsoil on which the inn is built is made-ground, which allowed the escaping gas to percolate to the surface. Alderman Gummer, J.P., the Chairman of the Gas Committee, was quickly on the scene; and with him was Mr. J. S. Naylor, the Engineer and Manager. The latter was actually on his way to see how the men were going on with the work at the time of the accident.

Bristol Public Lighting.

The Works Sub-Committee of the Sanitary Committee of the Bristol Corporation recently had before them a memorial presented to the Lord Mayor, towards the close of last year, from the Ratepayers' Non-Political Association, in which complaint was made at the abnormally high rates, and an opinion was expressed that as good street lighting could be obtained from gas as from arc lamps, and that some thousands of pounds a year could be saved if gas were substituted for electricity. The Sub-Committee recommended that the following report on the subject should be presented to the Council: "Your Committee would remind the Council that they adopted electric street lighting in consequence of the request of numerous sections of ratepayers for a better system of illumination in the principal thoroughfares of the city; and your Committee are of opinion that equal illuminating power cannot be obtained from gas at as low a cost as from electricity. In 1892 (before the adoption of electric street lighting), the proportion of the general district rate appropriated to street lighting amounted to 5·62d. in the pound per annum, the number of public lamps being 5548. At the present time, the portion of the rate appropriated to street lighting amounts to 5·58d. in the pound per annum, the number of public lamps of all descriptions (including arc lamps) being 9638; showing that, notwithstanding the large increase in the number of lamps, the citizens have obtained the benefit of ample illumination in the principal thoroughfares without any additional burden being cast upon the rates. Your Committee are of opinion that this result could not possibly have been obtained had it not been for the introduction of a system of illumination in competition with gas; and as the benefit arising from the lowering of prices due to this competition is enjoyed not only by the Corporation but by all private consumers, they decline to recommend the Council to revert to a system by which all competition is precluded." The report was adopted, and it will be presented at the next meeting of the Council.

In response to an application from the Finance Committee for a grant as usual from the gas profits in relief of the rates, the Belfast Gas Committee a few days ago unanimously resolved that a sum of £20,000 be paid out of the gas fund for this purpose.

At the last monthly meeting of the Bingley Urban District Council, some discussion took place as to where the responsibility rested for the expense in dealing with some choked ascension-pipes at the gas-works, which caused a shortage of gas for several days recently. The question was, however, deferred for fuller consideration in committee.

According to some preliminary tables of cases of industrial poisoning and fatal accidents in factories, workshops, &c., during the past year which have just been issued, there were 17 fatalities in gas-works, compared with 26 in the year 1905. Five were due to machinery moved by mechanical power, one to an explosion, one to an escape of gas, and ten to various causes.

Messrs. Bland and Co. have received a letter from Mr. W. R. Herring, of Edinburgh, in reply to a request made by them that he should have one of their inverted gas-burners tested. Mr. Herring says: "We have now completed our experiments, and I am happy to be able to report that the results we obtain are fully equal to what is claimed in the circular, and that this burner is undoubtedly one of the best on the market."

The second annual dinner of the Inspectors in the Maintenance Department of the South Metropolitan Gas Company, took place at the Horns Hotel, Kennington, on the 16th inst., under the presidency of Mr. H. C. J. Edwards, the chief of the department. The toast of the evening, "The South Metropolitan Gas Company and their Maintenance Department," was proposed by Mr. G. F. Morgan, who alluded to the excellent work done by the department, and to the ever-courteous attention of its chief. Mr. H. C. Gay, in replying, said the work was an educational one for the benefit of the consumers, and its usefulness was evidenced by the fact that in the short space of five years it had grown so rapidly that the department now maintained 50,000 burners a year. In responding to the toast of "The Chairman," Mr. Edwards expressed his pleasure at seeing such a gathering, which he took as an honour, not to himself, but to the Company under whose banner they served with such honoured chiefs as Sir George Livesey and Mr. Charles Carpenter. Other toasts were proposed; and the proceedings were enlivened by selections of vocal and instrumental music, under the direction of Mr. J. Golding.

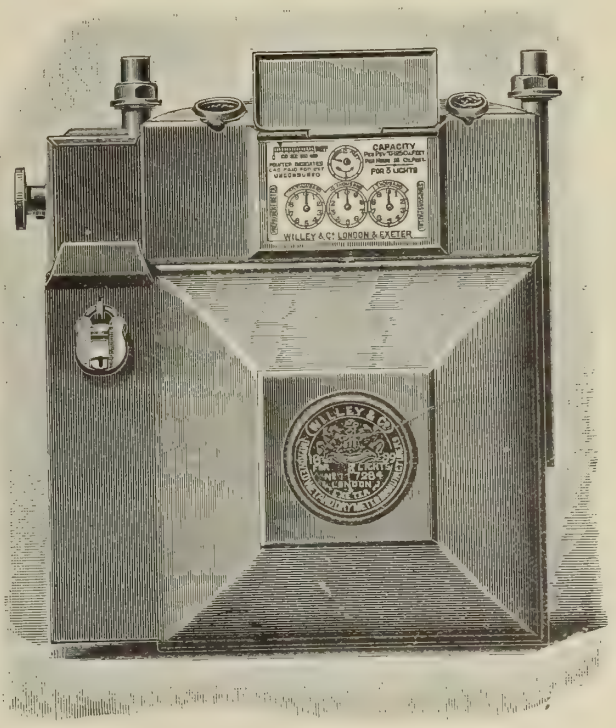
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of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

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ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

AGENTS FOR SCOTLAND:

D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

The Seisdon Rural District Council have applied to the Local Government Board for sanction to borrow £6000 for the provision of a water supply for the village. The loan asked for includes £1000 for the purchase of Kinver Mill, £4310 for machinery and contingencies, and £689 for extensions.

By permission of Mr. R. Sharpe, the Manager of the Belfast Corporation Gas-Works, the members of the class for gas officials held at the Municipal Technical Institute visited the works on the 16th inst. At the two previous meetings of the class, Mr. A. Percy Hoskins, F.I.C., the Analyst at the works, had lectured on "The Manufacture of Gas;" and the visit was intended as a practical demonstration of the principles and processes laid down in the lectures. On their arrival, the party were met by Mr. Hoskins, and they immediately entered upon the tour of the works. Following the plan of the class work, the order adopted was that of manufacture, commencing with the reception of the coal and ending with the despatch of the finished product. At the conclusion of the inspection, Mr. A. Williamson, the teacher of the class, thanked Mr. Hoskins for his interesting and instructive lectures and demonstration.

Messrs. R. & W. Hawthorn, Leslie, and Co., Limited, of Forth Banks, Newcastle-on-Tyne, have acquired, for an extension of their locomotive works, the chief part of the works formerly occupied by Messrs. R. Stephenson and Co. The two works have been established on adjoining sites for nearly a century.

The Richmond Gas Stove and Meter Company, Limited, held the half-yearly conference of their representatives last Friday, at their Warrington works—Mr. H. M. Thornton presiding. During the afternoon, a visit was paid to the new works at Grappenhall, and in the evening the representatives were entertained at dinner.

We have received from Messrs. C. & W. Walker, Limited, a pamphlet on Milbourne's patent luteless purifiers and valves, of which they are the sole makers. These appliances are shown in great variety, and the illustrations are accompanied by suitable descriptive letterpress. The diagrams showing various arrangements of connections with either inside or outside valves will be found useful, as will also the notes on the design of purifiers, and the advantages of those of the luteless type. The illustrations are very clear, and the pamphlet as a whole is a good specimen of printing.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GENERAL MANAGER (NEW LIGHTING AND HEATING GAS). Garlick and Co.
CARBONIZING FOREMEN. No. 4725.
WORKS FOREMAN. No. 4715.
WORKING FOREMAN. No. 4727.
CLERK. No. 4726.

Situations Wanted.

GAS-STOVE REPRESENTATIVE. No. 4722.
INDEX READER AND OFFICE WORK. 50, Woodward Road, East Dulwich.
MAIN AND SERVICE LAYER, &c. No. 4730.
SHOW-ROOM MANAGER OR INSPECTOR. No. 4729.

Plant, &c., For Sale.

BOILER, &c. No. 4728.
ENGINE AND EXHAUSTER. Mansfield Gas Department.
PIPES AND TANKS. No. 4721.
RETORT-BENCH FITTINGS, MOUTHPIECES, RETORTS, &c., &c. Arbroath Gas Department. Tenders by March 10.
STATION METER. Leatherhead Gas Company.

Stocks and Shares.

ALDERSHOT GAS COMPANY. March 19.
CAPE TOWN GAS COMPANY. March 6.
CHERTSEY GAS COMPANY. March 12.
CROYDON GAS COMPANY. March 6.
GLOVER AND MAIN, LIMITED. March 6.
HAMPTON COURT GAS COMPANY. March 12.
LEA BRIDGE GAS COMPANY. March 12.
PINNER GAS COMPANY. March 21.
SOUTHGATE AND DISTRICT GAS COMPANY. March 19.
SOUTHEND GAS COMPANY. March 12.
UXBRIDGE GAS COMPANY. March 12.

Company Meeting.

CAGLIARI GAS AND WATER COMPANY. Offices. March 5. Three o'clock.

Gas-Works Concession For Sale.

"Gas Engineer," c/o Horncastles.

Use of Retort-Bench.

"Secretary," Adelphi.

TENDERS FOR

Benzol.

MIDDLETON GAS DEPARTMENT. Tenders by March 11.

Chimney Stack.

BRECON GAS COMPANY. Tenders by March 6.

Coal and Cannel.

NELSON GAS DEPARTMENT. Tenders by March 14.
PADIHAM GAS DEPARTMENT. Tenders by March 11.
SALFORD GAS DEPARTMENT. Tenders by March 14.
SEAFORD GAS COMPANY. Tenders by March 9.

Condensers, &c.

BRECON GAS COMPANY. Tenders by March 6.

Fire-Clay Goods.

BRECON GAS COMPANY. Tenders by March 6.
LONG EATON GAS COMPANY.
MIDDLETON GAS DEPARTMENT. Tenders by March 11.

General Stores, Brass Taps, Fittings, Ironmongery, Lime, Oil, Paint, &c.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 5.
MIDDLETON GAS DEPARTMENT. Tenders by March 11.
NELSON GAS DEPARTMENT. Tenders by March 14.

Mantles and Chimneys.

DUBLIN CORPORATION. Tenders by Feb. 28.

Meters.

MIDDLETON GAS DEPARTMENT. Tenders by March 11.

Oil.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 5.
CARLISLE GAS DEPARTMENT. Tenders by March 4.
MIDDLETON GAS DEPARTMENT. Tenders by March 11

Oxide of Iron.

CARLISLE GAS DEPARTMENT. Tenders by March 4.

Pipes and Fittings, &c.

BRIGHOUSE GAS DEPARTMENT. Tenders by March 5.
MIDDLETON GAS DEPARTMENT. Tenders by March 11.

Purifiers, &c.

BRECON GAS COMPANY. Tenders by March 6.
KEIGHLEY GAS DEPARTMENT. Tenders by March 12.
LONG EATON GAS COMPANY.

Retort-Bench, &c.

BRECON GAS COMPANY. Tenders by March 6.

Sulphuric Acid.

MIDDLETON GAS DEPARTMENT. Tenders by March 11
NELSON GAS DEPARTMENT. Tenders by March 14.
RAMSGATE GAS DEPARTMENT. Tenders by March 9.

Tar and Liquor.

CARLISLE GAS DEPARTMENT. Tenders by March 4.
EXETER GAS COMPANY. Tenders by March 9.
NELSON GAS DEPARTMENT. Tenders by March 14.
PADIHAM GAS DEPARTMENT. Tenders by March 11.
RAMSGATE GAS DEPARTMENT. Tenders by March 9.
STOKE GAS DEPARTMENT. Tenders by March 6.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 524.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5½	..	5 1 10
50,000	10	Aug. 30	14	Bourne- mouth Gas and Water	10 p.c. Pf.	..	4 16 7
51,810	10	,,	7		B 7 p.c.	..	4 0 0
53,200	10	,,	6		Pref. 6 p.c.	..	3 15 0
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	258—263	−4	4 15 1
300,000	,,	,,	9⅜	Do. New	195—200	−5	4 15 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
706,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	225—230	−7	4 17 10
246,320	,,	,,	8¼	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Aug 15	6	Bromley, Ord. 5 p.c.	121—125	..	4 16 0
165,700	,,	,,	4⅜	Do. do. 3⅛ p.c.	91—94	..	4 15 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8⅞—9⅜	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	110—112	..	4 9 3
1,443,280	Stk.	Aug. 30	5 7/16	Commercial 4 p.c Stk.	110—113	..	4 12 0
560,000	,,	'	5	Do. 3½ p.c. do.	108—111	..	4 10 1
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	123—126	−2	5 3 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
432,070	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	105—107	..	3 14 9
486,090	10	Jan. 31	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4 1/16	Gas- light and Coke	4 p.c. Ord.	..	95½—96½*	..	4 11 4
2,600,000	,,	,,	3⅜		3½ p.c. max.	−1	87—89*		3 18 8
3,799,735	,,	,,	4		4 p.c. Con. Pref.	..	106—108*	..	3 14 1
4,193,975	,,	Dec. 13	3		3 p.c. Con. Deb.	..	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.		..	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.		..	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.		..	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental		−2	179—182	−2	4 7 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.		..	93—95*	..	3 13 8
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.		..	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.		+1	110—112	+1	3 11 5

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	167½—163½	..	4 3 1
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147*	..	5 3
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of	5 p.c. Deb.	..	101—103	..	4 17 11
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	..	101—103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.		..	11½—12½	..	5 12 0
1,775,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.		..	110—111	..	4 3 4
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.		..	96—97	..	3 12 2
15,000	10	Aug. 30	10	North Middlesex 10 p.c.		..	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.		..	13½—14½	..	4 16 7
300,000	Stk.	Nov. 29	11	Oriental, Ltd.		..	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.		..	6—6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.		..	7¾—8¼	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.		..	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.		..	94—96	..	4 3 4
851,070	10	Oct. 12	7	River Plate Ord.		..	12½—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.		..	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.		..	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		..	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A		..	248—250	..	4 0 0
209,984	,,	,,	10	Do. B		..	248—250	..	4 0 0
523,500	,,	,,	10	Do. C		..	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African		..	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.		..	24—126*	..	4 7 4
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.		..	84—85	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.		..	158—160	..	5 0 0
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.		..	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.		..	123—126	..	3 19 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.		..	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.		..	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6⅔	Tottenham and	A 5 p.c.	..	127—130	..	5 0 0
398,940	,,	,,	5		B 3½ p.c.	..	104—106	..	4 14 4
137,500	,,	Dec. 28	4	Edmonton	4 p.c. Deb.	..	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.		..	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		..	102—104	..	4 16 2
193,742	Stk.	Sept. 13	5	Tynemouth 5 p.c. max.		..	106—108	..	4 12 7
30,000	Stk.	Feb. 14	8	Wands- worth and	A 5 p.c.	..	—	..	—
255,636	,,	,,	6⅔		B 3½ p.c.	..	138—143*	..	4 10 11
75,000	,,	,,	5⅝		C 3½ p.c.	..	111—113*		4 19 1
79,416	,,	Dec. 28	3	Putney	3 p.c. Deb. Stk.		79—82	..	3 13 2
845,872	,,	Aug. 15	5⅜	West Ham 5 p.c. Ord.		..	104—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref.		..	122—125	..	4 0 0
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.		..	102—105	..	3 16 2

Prices marked * are "Ex div."

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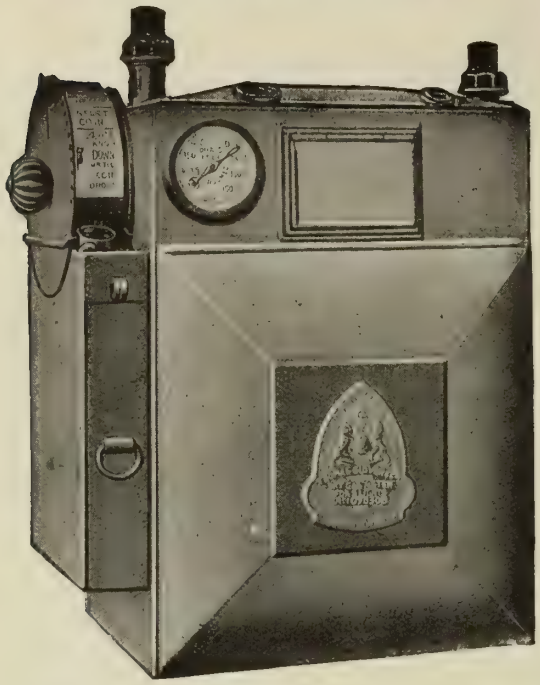
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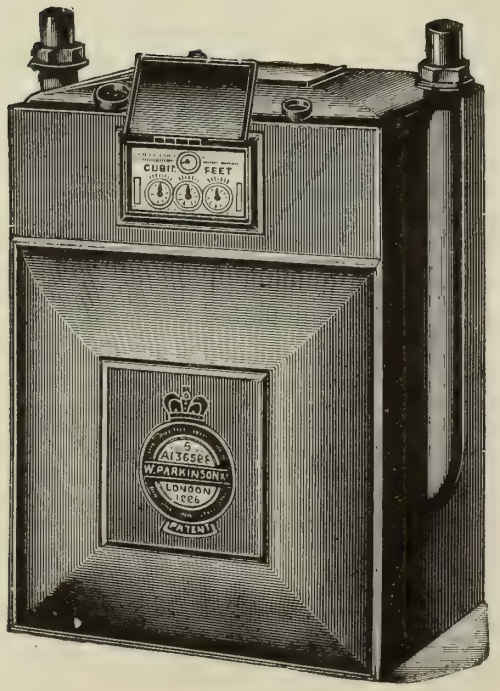
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EDITORIAL NOTES—GAS, &c.

The Passing of Two Workers.

IT is our sorrowful duty this week to have to chronicle the closing of the lives of two good workers—men who have lived well, and have enriched the world by so doing. One bore a name that was almost a household word; both bore names honoured in many scientific and practical spheres. We refer to William Sugg and William Young. Round their names cluster many memories; round their names cluster much work that has individualized them among men. Theirs were centres from which there was great devolution, by which science, industry, and the world at large profited. They worked, and worked strenuously, because it was of their nature to do so; mental activity being part of their very existence. Their labours lay in different ways; the effect was the same. They both founded and constructed. They sought to develop, and succeeded in developing, from that which came to their hand greater richness. From crudity, they brought refinement. Through them, Science was applied to very practical purpose. Regard and care for the infinitesimal was one secret of their success. By scientific means, William Sugg evolved what was necessary to bring out with greater effect the illuminating qualities of gas for the user, before the ancillary mantle came to the assistance of gas, and then he utilized the mantle in effecting further illuminating improvement. He raised for the gas producer the status of quantitative and qualitative determination and definition. He applied, too, his inventive ability to the improvement of the means of utilizing gas in other directions. This covers much of the ground of his work; it does not embrace all. Its influence was world-wide.

Labouring in the physico-chemical world, Mr. William Young brought a great erudition to bear upon work in the destructive distillation of raw material, in the recovery of the products, in the fractional distillation of oils, and in their gasification. He applied his learning, his investigations, his discoveries to practical use. He was a great man; but a student to the last. His work was his hobby. The retentiveness of his memory was marvellous; it was a storehouse of wisdom and useful fact. From that storehouse we have succeeded in rescuing much that has adorned our pages and expanded knowledge. The last of his literary work appeared in the "JOURNAL," in which he traced the development of the vertical retort in the shale-oil fields, expounded principles, and criticized what his knowledge led him to believe to be erroneous views and judgment. His contributions and work on the naphthalene problem and on the gasification of oils have each and all had vast influence. He was of a retiring disposition; but even to the last, though age and health enfeebled, kindliness and willingness to serve were inseparable from his nature. Many were glad to sit at his feet and learn; for he was a willing instructor and friend.

William Sugg and William Young have both been men of many parts. Men of brain and power, versatile in action, and sure in result. They were very human, warm-hearted, true friends, and transparent in honesty of purpose. We hold them in affection; and their memories are enshrined in many hearts. The influence of their friendship will go through the lives of their contemporaries whose privilege it was to have close relationships; their work will be for them an imperishable memorial in the ages to come. By their own work, they have left this world better than they found it; and the glory of that cannot fade away.

Metropolitan Gas Companies' Accounts.

IN last week's issue of the "JOURNAL" (p. 544) there was given the usual tabular statement of the accounts of the Metropolitan Gas Companies for the past year. It will be seen therefrom that the total capital, including premiums, engaged in the supply of gas in London on Dec. 31, 1906, amounted to £38,357,260; being an increase of £115,844. The South Metropolitan and Commercial Companies added £100,000 and £35,969 respectively to their capitals; but the Gaslight and Coke Company reduced theirs by £20,125. The income derived from this invested money came to £6,244,048, and £4,587,259 was expended in earning it; leaving a gross profit of £1,656,789—being at the rate of £4 6s. 5d. per cent. on the capital, and £35 13s. 8d. per cent. on the total gas-rental. These figures are rather higher than those for the previous year, and approximate closely those for 1904, which were £4 7s. 2d. and £36 respectively. From the second table, which gives the figures in the preceding one worked out on the basis of each 1000 cubic feet of gas sold, it will be seen that the Gaslight and Coke Company stand highest, and the South Metropolitan Company lowest, in the matter of capital, outlay, income, expenditure, and gross profit. Taking the mean of the three Companies, the figures are as follows: Capital, 20s. 9·04d.; income, 3s. 4·54d.; expenditure, 2s. 5·78d.; profit, 10·76d.—all very close to those for 1905. The third table shows that last year there was an increase of £148,458 in total revenue; no less than £94,739 of it being attributable to the largest Company. On the other hand, there was an increase of £5964 in the expenditure, which reduced the profit to £142,494. In 1905, however, there was rather more than this sum (£147,417) shown as a loss. The item of £43,469, representing decreased expenditure on purifying materials and on labour in connection with their use, is a significant feature, and shows the effect of recent legislation. The drop of about £30,000 in salaries and wages connected with manufacture and of some £10,000 in law and parliamentary charges should not be overlooked.

The following table shows the carbonizing results of the three Companies, so far as they relate to the manufacture of gas from solid raw material only. Though, for the most part, they do not vary much from those for the preceding year, there is a material increase in the make of gas per ton in the case of the two larger Companies; and the mean of the three works out to 10,811 cubic feet, compared with 10,539 and 10,474 cubic feet in the two preceding years.

TABLE *showing the Residuals produced and the Gas made per Ton of Coal by the Metropolitan Gas Companies in the Year* 1906.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
GASLIGHT AND COKE .	12·55	4·89	9·79	30·95	10,714
SOUTH METROPOLITAN .	12·37	4·89	9·82	34·31	10,960
COMMERCIAL	12·25	6·57	11·65	34·18	10,752
Mean per Ton . .	12·45	5·00	9·93	32·46	10,811

Power Business and High-Power Fancies.

COMMERCIAL necessity must in the future largely dominate the technical work of gas manufacture. This is a truism that has had slow growth in acceptance; but the competition of modern times has accelerated the growth in a most noticeable manner. Most of us can, within our own sphere of work, readily put a finger on theories that at one time became practical principles, but which, with the changing circumstances, have undergone dissolution, and have had to be discarded, though reluctantly by some, through the inexorable external pressure of progress and the accumulation of knowledge. The experience is a historical one; and history has a way of repeating itself. It is repeating itself in the gas industry; and we have only to go back to the report of the discussions at the last meeting of the Manchester Institution of Gas Engineers, as reported last week, for the proof. These were the adjourned discussions on Mr. G. E. Stevenson's paper on "Experiences in Competi-" tion for Power," and Mr. Edward Allen's communication

on "High *v.* Low Grade Gas." These papers (which were published in the "JOURNAL" for Nov. 27 last year) are, in a sense, somewhat antagonistic. The one, in effect, urges the cheapening of manufacture by all available means, in order to resist attack at the most vulnerable part of the gas business; and in effect, too, it is a plea for the production of a gas that is the most serviceable, in price and constitution, not for one purpose only, but for all. The other paper is a defence of the practice, inconsistent with modern needs, of maintaining a high illuminating power for one purpose only, and that an unprofitable one to the user. In considering this question, it is not always sufficiently borne in mind that the stepping down from a high illuminating power to a gas of lower grade in this respect, but of good calorific power suitable for the bunsen burner, for heating and cooking, and for motive and other industrial purposes, places in the hands of the gas maker an invaluable commercial advantage in the greater range it affords him in the purchase of materials. However, looking at the papers in conjunction with the discussions, it is quite easy to see why commercial necessity in the gas industry must largely in the future dominate both technical determination and practice, and why it is that theories and once cherished principles have to be abandoned, without dishonour to them, in favour of others better adapted to modern circumstance.

In discussing the question of the supply of gas for power purposes on previous occasions, it has been shown that the power business of the gas industry is considerable, and is worth keeping; and it follows that what is worth keeping is worth developing. There seems, however, to be a tendency—limited, we are glad to say—to question the potency of the competitors for this business. That is a mistake. It is always wise to over-estimate rather than under-estimate the power of an opponent or opponents. Mr. Tim Duxbury—who seems to think this question of power supply is being attacked on panic lines—spoke as though suction-gas plants constituted the one and only competitor with which gas has to deal, and that its power as a competitor is being over-rated. There is also the electrical motor; and, encouraged as it is by prices which, in their diminutiveness, suggest that commercial principles are sometimes grossly abused in their making, it is by no means a competitor to be ignored. It is an absolutely sane method of dealing with business affairs to look on their serious side, though Mr. Duxbury is afraid that too much regard is being paid to that side in connection with the power business. The question is one that does not seem to us to present any humorous aspect, unless it be that Mr. Duxbury is regarding with perfect composure—even with the moderate prices of from 1s. 9d. to 2s. 2d. for gas in Oldham—the appearance in his district of "some suction-gas "plants." It may be suggested that these plants are entering at the top end of the motive power business in Oldham, and further that, at the other end, the electric motor has gained entry. The commencement of such sandwiching and squeezing movements is not generally the end. And when a beginning has been made, it is the time to ascertain why, and to inquire how far the gas purveyor can go without detriment to, but to the advantage of, his other consumers, to avert further displacement or to obtain new business.

There were one or two speakers who had much to say regarding the doing of business at the expense of lighting consumers. The spirit that animated those speakers is commendable, though its conception be a mistake. There are circumstances under which the retention of a day consumer—though the profit drawn from him on the 1000 cubic feet basis may be comparatively small, but in the aggregate not unsubstantial—may be to greater advantage to the lighting consumer than the loss of that day consumer. It appears to be forgotten that where the attack of electricity is the strongest for lighting is among the largest consumers, who are, taken separately, the most profitable (in proportion) of the business connections of a gas undertaking; and that, generally speaking, the lighting consumers who remain are (again taken separately) of very moderate account, and of seasonal inconstancy in their demand, and whose heaviest demand comes when the resources of an undertaking have the greatest pressure upon them. These are the consumers who are most benefited by the accumulations of profit that can be drawn from any source of business—particularly an all-the-year-round day business—more substantial in volume and more constant than their own. The old objection to differential prices still survives in places. We also believe firmly in making prices generally as low as possible, and differences in prices for various purposes as narrow as the circumstances will permit. Even certain managers who are favourably placed in relation to both materials and friendly capital accounts, find the necessity for differential prices; but there are other managers, also similarly favourably placed, who evidently fail to recognize in the discussion of this question that their propitious conditions are not universally enjoyed, and decline to acknowledge that there may peradventure be cases where their firm rule in respect of differential charges may, with benefit, be relaxed to widen scope. There is no virtue in equality where equality injures. Further, we have never been advocates, under latter-day conditions of the gas business, of flat rates to consumers irrespective of volume of business, or of constancy and duration of consumption. It is modern competitive business with which we are dealing, and with nothing that is sentimental or philanthropic in its objects. Each case of power supply, each case of supply for other purposes that is abnormal in its character, must or ought to be dealt with on its merits from a business point of view.

There was also a good deal said in the discussion about prices for power. Prices cannot be fixed in any haphazard or perfunctory manner, nor can the rate of charge be the same between one undertaking and another, nor between one consumer and another. Consideration must be given to the conditions of both the undertaking and the character of the business to be done. All that Parliament, receding from recent stringency, asks now is that the terms and the amount of charge shall, in the case of any one undertaking, be the same to consumers "under like circumstances." The prices mentioned by various speakers in the discussion moved between 1s. 6d. and 2s. per 1000 cubic feet for power business; and any one of the prices quoted may be profitably correct for particular towns, and may command the business to be done in them. But the fairly favourable price of 1s. 9d., offered by Oldham, has not stopped the installation of "some "suction-gas plants."

In regard to Mr. Allen's paper, his advocacy of high-grade gas, and the methods that he applied to testing gases of various qualities to support his advocacy, the crushing and poignant criticism that he received from the members needs nothing from us in the way of addition. We had a say at the time the paper was published; and our animadversions have the endorsement of representative progressive men of the industry, whose opinions have been constructed on tests intelligently and scientifically performed. Before their barbed shafts, the defence made by Mr. Allen of the policy of supplying high-grade gas fell, and fell ignominiously. Not even the "love" of the Liverpool householder for the flat-flame burner, or the publican for its "glorious light," or the butcher for its "golden flame" which realizes him a penny a pound more for his meat, mitigated the effect of the attack. The flat-flame burner has had a useful life; and in its fast declining years it would ill become us to humorously regard the wreath of grandiloquence bestowed on it in the paper and in the reply to the discussion. After the Manchester experience, an advocate of the languishing high illuminating power policy will hardly care to face again a meeting of gas men whose motto is "Advance."

The Midland Association Meeting.

IN the closing lines of the address with which Mr. Hubert Pooley, of Stafford, inaugurated his presidency of the Midland Association of Gas Managers, he remarked that he felt he had left unsaid a good deal which he might have said. It would be a voluminous address indeed with such an infinite subject as the affairs of the gas industry from which to draw, that did not show omission. But what Mr. Pooley did say, he said remarkably well; and his choice of subject and method of treatment—a method ingrained with the wisdom of an observant engineer and manager, and still a student—furthered the already high respect in which he is held by the members of the Association. Some men shake off their student habits on passing from the discipline of school and pupilage; while to others the entry to the higher responsibilities of compensated duty is merely, in the set-purpose of gathering in knowledge, the passing from the rudimentary stage to the continuation school of practical experience. Mr. Pooley, it is manifest, enjoys life among the latter. His brief review of our industrial and technical progress served as an admirable introduction to matters to which he has given especial attention. In passing, he delivered to the accumulated experience—to which Mr. Prince at Manchester the previous Saturday had subscribed

in similar way—his testimony to the valuable accretions in gas production and reductions in troubles, brought about by the simple, and comparatively inexpensive, application of governors to the regulation of the conditions of carbonization. His gains are an additional gas make per ton of coal of 500 cubic feet, less carbon in the retorts, and the reduction of the number of stopped ascension-pipes to about 3 per cent. of what it was formerly, but he says nothing as to the illuminating power.

The President is strong on comparative costs and other statistics; and he believes thoroughly in the tabulation of results by gas managers, so that they can see at a glance the rise and fall of their financial and working results. Tabulation makes for regulation; and regulation for economical working. In Mr. Pooley's eagerness to rescue from statistics their lessons, he has discovered many things; among others, that there are quite a number of undertakings whose delivered cost price of working is in the region of 1s. per 1000 cubic feet. This is interesting, in view of the renewed discussion of legitimate prices of gas for motive power purposes to meet the competition of the quartet of competitors—electricity, producer or suction gas, steam, and oil. The President speaks from the platform of the Engineer and Manager responsible both for a gas and electricity undertaking; and he assures us that with electricity at prices between 1¼d. and 2d. per unit for power purposes, business is not only possible, but is also commercially sound. As a matter of fact, quite half the output of electricity at Stafford is supplied for power purposes at the lower figure. The principle which guides Mr. Pooley in this matter is that the machinery is run at periods when it would otherwise be idle; and to do this very little additional labour is required up to a certain point. The President is well supported in his belief that a parallel case could be made out for the regulation of a price for gas supplies for power purposes, and that such modifications in price should be made. He takes his stand against the narrow view of the few that only large consumers are benefited by such reductions for power; and he sees beyond the serving of communal interests by encouraging industrial activity in this manner.

The Stafford Corporation is the only authority in the country who have adopted a gas-works "profit-sharing "scheme"—if that is the correct title for it. We hardly think that it is. The system was introduced in Mr. J. Ferguson Bell's time; but it has undergone modification at the hands of Mr. Pooley, and is now purely a bonus scheme based on labour results. But by whatever name it may be known, the effect is the same. Labour costs have been considerably reduced; and this, the President is persuaded, has been attained to a considerable extent by the pocket interest of the men. The relations between labour and the management are also most cordial. The figures need only be glanced at to show the relative gains of Corporation and men. It is one of the obscurities of the times to find so few in the gas industry adopting this and similar methods of cementing the interests and relationships of Capital and Labour when there is a consensus of praise from those who have introduced one or other method, and found in it the very thing that was wanted.

Not a less interesting part of the address is the section showing the progress of the prepayment meter and cooker business at Stafford. The town has not greatly developed over a long period of years. There has, however, been a steady growth in the prepayment meters fixed; but the President has been somewhat exercised as to the approach of finality in cooker connections. The margin between the number fixed and the number of houses, is only 10 per cent. —in other words, about 90 per cent. of the houses in the district have cookers in them. We can sympathize with Mr. Pooley in that he has not greater scope in this direction for his ardour. But there it is; and it is a condition that cannot be altered. New fields to conquer are required; and the President has been trying to persuade his Committee that a gas-fire and heating-gas scheme (of which particulars are given in the address) would be a valuable and profitable business. He draws a hypothetical case presenting result; but we believe he is too sanguine in entertaining the idea that he could, under such a scheme, place three gas-fires in each house where a cooker exists at the present time, and also in the estimate of four hours' burning per day of each fire throughout the four winter months. He would be a benefactor to Stafford generally, and to his undertaking in particular, if he could do this. But we doubt it.

The only paper read was by Mr. Sidney O. Stephenson, of Tipton; and it was on "Automatic Street Lighting." It was somewhat long; but in it Mr. Stephenson has done something that, to the best of our knowledge, has not been done before—that is, collected into handy form the details of the best-known systems of automatically lighting and extinguishing street-lamps. The country through, a greater amount of attention is being given to this subject than appears on the surface; but opinion is conflicting on several points concerning it. Many of the original sins of these automatic contrivances, which gave them a bad name for unreliability, have been wiped out; and the main consideration is now that of the balance of return on expenditure. If there is satisfaction on this head, the next point is as to whether it is advisable to adopt a clockwork or a pressure arrangement. There is one great objection to clockwork devices that, when the streets are suddenly shrouded in fog between extinguishing and lighting-up time, an individual visit has to be paid to each lamp, owing to the clocks being definitely set; or if a heavy fog is on at the time for extinguishing, out the lamps go, though the preference is that they should remain alight. It is, of course, an advantage on the side of the pressure arrangements that they can at any time be operated from one point, and that point the gas-works. The periodical adjustment of the clocks is also averted by the pressure systems. It is the pressure apparatus of Messrs. Alder and Mackay that Mr. Stephenson has put in at Tipton; but he also spoke very highly of Dr. Rostin's method, which has for long been in considerable use at Tottenham. The Gunning, the Horstmann, the Falk-Stadelmann, and other arrangements had attention. Of course, in considering cost, convenience must not be overlooked. To be able to light up at will from one point whenever required, is an advantage of immense value. The electric light has no doubt done its part in dishonouring the primitive and cumbersome methods of ladder or torch, and the double visit each day.

Under the New Testing in London.

We have to acknowledge our indebtedness to Dr. Frank Clowes, the Chief Chemist of the London County Council, for the weekly tabulations of tests made, in and since the week ending Dec. 15, under the altered system of gas testing in the Metropolis. The prior returns will not now be printed. Those to hand cover the winter period of exigent conditions in gas manufacture; and we must say that whether critically examined from the point of view of illuminating power under the standard conditions of testing, of the results by the flat-flame burner, of calorific power, or of sulphur, the Companies have really done exceedingly well. Generally speaking, the Gaslight and Coke Company have, over the period referred to, maintained the illuminating power of their gas with narrower margin from their 16-candle power standard than have the South Metropolitan and the Commercial Companies with their 14-candle gas. The excess illuminating power in the case of the latter Companies is perhaps due to the inability in the one case to get closer at present (making coal gas only) to the 14-candle standard, and, in the case of the other, an absence of desire to at present attain to closer working to their standard. Both the Gaslight and Coke and Commercial Companies supply an admixture of coal and carburetted water gas. Without going precisely into the figures, it may be said that the South Metropolitan consumers have been receiving on the average during the winter gas of about 2 candles above the standard illuminating power. There are several interesting matters to be extracted from the tables.

Illuminating Power.

For instance, taking the last week of December, it is seen that the average illuminating power of the gas of the Gaslight and Coke Company under standard testing was 16·7 candles; while that of the South Metropolitan Company was 15·8 candles—a difference of 0·9 candle. But in the flat-flame tests, the average illuminating power of the Gaslight and Coke Company's gas was 11·9 candles, and the South Metropolitan Company's 10·7 candles —a difference of 1·2 candles. The average of the standard tests for the Commercial Company was 14·9 candles; by the flat-flame burner, the illuminating power was 9·3 candles. So that, while there was a difference between the average illuminating power

of the Commercial Company and that of the Gaslight and Coke Company of 1·8 candles under standard testing, there was a difference of 2·6 candles shown by the average of their respective flat-flame testings. Again, comparing the Commercial Company with the South Metropolitan Company, the difference between the averages of the standard testings was 0·9 candle; with the flat-flame burner, 1·4 candles.

Calorific Power.

Keeping to the same week, and taking the calorific power tests, though the illuminating power of the South Metropolitan Company is less than that of the Gaslight and Coke Company, the calorific power of their respective gases is about on an equality—this being due to the difference in the composition of the gases. But we have here some interesting contradictions of the theory that calorific power follows illuminating power—whether the gas is straight coal gas or an admixture of coal and carburetted water gas. In one test of the South Metropolitan Gas Company, we have an average illuminating power of 15·6 candles; and an average calorific power of 141·4 calories. Looking a little higher in the list, another station returns the average illuminating power as high as 16·1 candles, but the calorific power as 133·5 calories. In other words, in these two instances, the lower illuminating power gas gives the best return in calorific value; the higher illuminating power gas, the lower calorific value. This must not, of course, be taken as the rule of the figures. But the same thing can be found in the figures of the Gaslight and Coke Company. Here we have a 17·5-candle gas giving 134·6 calories; a 17·2-candle gas, 133·8 calories; a 17·1-candle gas, 131 calories. On the other hand, three returns of 16·7-candle gas give 139·9, 139·4, and 138·7 calories. We may take an early opportunity of making a further inspection of these instructive returns.

The Manchester Gas Exhibition.

The Manchester District Institution of Gas Engineers have secured the co-operation of the Society of British Gas Industries in the promotion of the exhibition that is to be held at St. James' Hall, Manchester, from Oct. 23 to Nov. 9, 1907. The Society have appointed representatives (including the President, Mr. Dugald Clerk, and the Hon. Secretary, Mr. Charles Clare) to serve on the Advisory Committee with the members appointed by the Manchester Institution. This conjoint action will ensure the success of the promotion, and the display that will be made will without doubt bring the ultimate success aimed at. Mr. H. Kendrick, the Hon. Secretary of the Manchester Institution, announces that already several applications for space have been received.

Standard Clauses in Contracts.

Confluence in usefulness has been effected between the Institution of Gas Engineers and the British Society of Gas Industries. Representatives of the Council of the Institution and of the Society are meeting to consider and determine upon, if possible, a draft set of standard clauses in contracts; and it is hoped that good will ensue. If clauses mutually satisfactory can be agreed, they will not, of course, be obligatory upon any undertaking or contractor; but much discontent and dispute will be avoided by their acceptance. They are certain to be widely adopted. That has been the experience in the electrical industry, with the standard clauses jointly drawn up by the Institution of Electrical Engineers and the electrical manufacturers. It is hoped that this conference between representatives of the Institution of Gas Engineers and the Society will, by success, be the opening to much future useful collaboration.

The British Patent Law.

The presidential address of Mr. Dugald Clerk to the Society of British Gas Industries will surely claim consideration from all whose eyes it happens to meet, and who are interested in any way in invention and its protection. In connection with patentable invention, Mr. Clerk occupies, we should say, almost a unique position, for in him is represented the trinity of inventor, manufacturer, and patent expert. Inventor, manufacturer, and patent expert that he is, his views are not the popular ones. Perhaps it is because his survey of the general subject is taken from an altitude above that from which the ordinary student of these things makes his observations; or it may be that triple and overlapping interests have an obscuring effect, and will not allow the same strong searchlight to bear upon each quarter of the question that the man applies who makes his observation from one standpoint only. While admitting that the British patent laws are capable of improvement (and he points out the respects in which, in his judgment, they can be, and ought to be, amended), he is of opinion that, as they stand, they are superior to those of other countries. In proportion to population, Great Britain is the most inventive field in the world; and England is regarded by foreign inventors and manufacturers as the leading field for the profitable development of inventions. This being so, Great Britain can afford to name her own conditions, and use her power to secure for British inventors and manufacturers easier conditions in other countries. Other countries put an embargo or disability upon British inventors that is very mischievous; but Mr. Dugald Clerk is not of opinion that retaliation, by inflicting compulsory working upon foreign inventors in this country, is the right way of redressing the evil. He considers the better way is for the British Government to approach the Governments of other countries to remove the disability. There is wisdom up to a point in this. But it would be a strong weapon in forcing compliance with demand if compulsory working conditions upon foreign patentees existed in this country. It is true that this country is found by the foreign inventor a fertile and cheap one for exploitation; and that is a condition that is stable. To approach foreign Governments, our Government must offer a *quid pro quo* for anything that they ask other countries to surrender; and if they can offer like for like, with the additional advantage of plentiful capital and commercial enterprise, the success of their mission is more likely to be assured. Anyway, Mr. Dugald Clerk's address seems to us to show conclusively that compulsory working in this country would not impose the same hardship on the foreign inventor that the onerous conditions of other countries now place upon British invention. The address is full of interest and instruction upon this vexed question. It brings before us the reverse of the arguments generally adduced in this country in considering the shortcomings of our patent law—shortcomings not judged by comparison with other countries, but judged by home experience.

The Prevention of Corruption Act.

There can be no excuse for anyone going wrong now through any misinterpretation, or misapprehension as to the intention, of the Prevention of Corruption Act, 1906. There has been much searching for loopholes in the Act; and there has been much vain imagining that this and that expression would not have application to the particular form of courting favour or disfavour indulged in by those whose business and incomes have been held intact and developed by nefarious practices. For the proper understanding of the Act, it was necessary to know what had led up to it; for the proper appreciation of the terms of the Act, the past *dicta* of legal authority required to be unearthed. Mr. C. E. Brackenbury, barrister-at-law, has probed into these matters; and he has presented, in the paper read last Wednesday before the Society of British Gas Industries, the best exposition of not only the Act, but of the position of the law bearing upon the Act preceding its advent in operation, that we have yet seen. After what he tells us, after expounding with explicitness the legal meaning of terms and phrases, there need be no further quibbling. The Act is the top stone in the fabric that has been erected to stop dishonesty in business relations. It converts those who were, through wrong-doing in this respect, subject to civil action and forfeiture of position and character into criminals subject to criminal law and its penalties. Even the plea of custom is found to be a broken reed; there can be no custom for a crime. The Act, as we have said before, is a comprehensive one; and Mr. Brackenbury shows, by his studied exposition, that it is comprehensive to a degree that the best wit of man can devise. The whole paper (of which the pressure upon our space only permits of an abstract being published) enforces, from beginning to end, the gravity to the person of the forms of malpractice with which the Act deals; but the paper also shows how easy it is, by merely refusing to soil the hands in this way directly or indirectly, to keep above the law. We would suggest to the representatives of the Society of British Gas Industries who have been appointed to consult with the representatives of the Council of the Institution of Gas Engineers on standard contract clauses, that they should

propose the addition of one, as advanced by Mr. Brackenbury, to the effect that nothing in the nature of bribes, commissions, or gifts shall pass between the parties to the contract or their representatives. The Society might also well accept the further suggestion that they should unite themselves to the newly-formed League for the prevention of commissions and bribery. Conscientious answers and compliance with the catechism propounded by Mr. Brackenbury at the end of the paper should maintain perfect uprightness.

The Acetylene Association.

The sixth annual meeting of the Acetylene Association, which took place last week (and a report of which appears elsewhere in this issue), was marked by a departure which cannot fail to increase the interest in, and usefulness of, these gatherings. In addition to discussing the affairs of the Association and listening to an address by the President—which has hitherto constituted the business at these meetings—those who attended on the present occasion had four papers read to them on subjects closely affecting the industry, besides witnessing various demonstrations of the uses to which acetylene can be put. The papers were short; and the demonstrations were admirably carried out. In connection with the latter, perhaps special mention may be made of M. Hublin, who came over from Paris purposely to show the members the application of acetylene (together with oxygen) to the cutting of metals. Altogether, the programme constituted a full afternoon's work. From alterations in the Articles of Association which were submitted, it may be assumed that future meetings will be held later in the year than has hitherto been the case; it being thought that this will be another change which will prove welcome to the members generally.

Second Session of the Midland Junior Association.

Although the Midland Junior Gas Engineering Association held their second annual meeting on Saturday, the session is not yet finished—in fact, there still remains one fixture on the programme which holds out certain promise of pleasure and profit. We refer to the invitation extended to the members by Mr. T. Berridge to visit the Leamington Gas-Works; it having been arranged that this shall take place on the first Saturday in April. Knowing Mr. Berridge, it is perfectly safe to take the success of this coming meeting as a foregone conclusion; and it is not too early therefore to sum up the work of the present session. It must not be forgotten, however, that there is, in addition to Leamington, what may be termed an "extra," in the shape of the visit which Mr. J. A. Mobberley has (as already stated in the "JOURNAL") invited the Association to pay, next June, to the fire-clay works of Messrs. George K. Harrison, Limited—an outing which is also being much looked forward to. Turning to the purely business meetings, it may be at once remarked that the papers and discussions have been such as to reflect the greatest credit on all who have taken part in them. They have naturally been somewhat fewer than during the first session, owing to the fact that there has been only one meeting—either business or works visit—each month; but the quality has shown no signs of falling off. So much, however, the Council in their report are unable to say of the average attendance at the meetings, which has been smaller than last year. As Mr. Tatam pointed out, last year the Association was quite new; and to this fact the larger attendances would naturally be attributable. But the Council refer to the distribution of copies of the papers in advance of the meetings, and express the hope that this is not to any extent responsible for the smaller number of members attending. Inasmuch, however, as the circularizing of the papers has certainly led to better discussion of them, while its effect on the attendances is at any rate problematical, the balance of advantage would undoubtedly seem to be in favour of the plan of issuing prints in advance of the meetings. And when all is said, an average attendance of 45 is very good (though, of course, that is no reason why the members should not try to improve on it next session); and the increase in membership proves that interest in the Association is growing rather than otherwise. In addition to the indebtedness of the members to the readers of papers, their thanks are due to all those who are responsible for the management of the Association—and particularly to Mr. Hewett, the indefatigable Honorary Secretary—for bringing its affairs into the present eminently satisfactory condition.

WILLIAM YOUNG.

THE death of Mr. William Young, of Harehope, at his residence at Priorsford, Peebles, on the afternoon of Friday last, removes from the activities of this world one who had no peer in the particular branches of science in which he interested himself. His whole life-work was in connection with the gas industry and with the oil industry of Scotland; and while the former benefited greatly by his researches, the latter owed to him its position as a commercially profitable enterprise. It was he who took it from a languishing cradle and placed it upon its feet fully equipped, and who, for more than forty years, was its mainstay. While these industries absorbed his business attention, there was not a connection he had to whom he did not endeavour to introduce some improvements, and few which he did not leave better than he found them. His studies and his achievements—to speak of struggles would be a misnomer, for though he was born poor, his first effort brought him a competency—would fill a volume; but subjoined are a few of the more notable incidents of his life.

Mr. Young was born at Selkirk 66 years ago, and was the eldest son of Mr. John Young, the first Manager of the Selkirk Gas Company. When he was about thirteen years of age, his father removed to Dalkeith, where he became Manager of the gas-works—a post which he held for fifteen years. Thus the subject of this notice breathed the air of a gas-works from his earliest days, and during all the receptive period of youth his nurture was amid surroundings that tended to give his mind that bent towards the study of problems relating to gas supply which he manifested to the last. More than this, his up-bringing was in the very hot-house of gas-works management; for his father, at a time when little was known upon such subjects, was a recognized authority on the chemistry of coal, and was besides very extensively employed as adviser in the construction of gas-works and gas plant. It was doubtless owing to his father's position that William Young, in his youth, came under the influence of Mr. Peter Brash, a soap, candle, and oil manufacturer, of Leith. This influence was so beneficial that Mr. Young, to his latest day, spoke of Mr. Brash as his "scientific father." This gentleman lent him books on scientific subjects, and encouraged him to attend lectures by Dr. Lyon (afterwards Lord) Playfair, and other scientists, from whom he learned much. At this period he became acquainted with Mr. Alexander Bell, now Gas Manager at Dalkeith; and the fortunes of the Young and Bell families have since been linked together in a manner which makes it impossible to treat of the one without bringing in the other. William Young was placed by his father as apprentice to the plumbing and gas-fitting trade in Dalkeith; and the journeyman with whom he worked was Mr. Bell. Even in his apprentice days (Mr. Bell relates) William Young would never do anything as other people did—he was always improving upon old methods; and many a castigation he got for presuming to disturb the conservative routine of the workshop. But his merits soon began to be realized; for he had not long finished his apprenticeship when he introduced a system of rolling lead which enabled the output to be trebled. His first appointment came to him in 1863, when he was made Manager of the gas-works at Lasswade—a small town about two miles above Dalkeith. In this post he succeeded his friend Mr. Bell, who had gone to Gibraltar. Young was then about 22 years of age, and his salary was £75 a year, with a free house. At Lasswade his restless genius soon led to the termination of his career as a gas manager, which had been a brief one, and turned him on to the oil industry, in which he did long and very distinguished service. The change was brought about in a manner so natural that a narrative of it reads like a tale from a story book.

Quite close to Lasswade, there was a colliery which had been closed for a long time, but had been recently reopened. A large quantity of what was called by some "blind shale," but which generally went by the name of "blaes," had been thrown out as waste material. At that time oil had been made for some time at Bathgate, from the substance which figured in the Law Courts under the designation of "Torbanshill Mineral." A beginning had also been made with the recovery of oil from the richer shales. The Scotch oil industry had, in reality, been born; but it was in a very weak state of health, and its fortunes were not of any concern to Mr. Young. When, however, he saw the shale at the Bonnyrigg pit, he said to himself that if it was possible to make oil out of shale, there must also be gas in it. So he took some of the stuff home, and tried it in a gas-retort. The result surprised him; for he found that he could make from 8000 to 9000 cubic feet of very good gas from a ton of it. Thereupon he asked the colliery owners to be supplied with the shale, and was told that he might take as much as ever he wanted—that he was welcome to it. He availed himself of the offer, and thus came to have about him a quantity of the material, which he handled daily, and so became better acquainted with its properties. He was making gas at a net cost which was lower than probably ever was experienced before, or has been since; and he was content, so far as he himself was concerned. But everybody else was using shale for the recovery of oil from it; and his spirit was such that he must perforce apply his mind to the problems with which oil manufacturers were wrestling. Thus was he led to the study of the oil industry, of which he was to become the saviour.

So far shale was being distilled in horizontal retorts, with the

result that, before the oil could be drawn off, it was baked, or burnt, and was thus of a very bad colour, incapable of refinement so as to be made attractively marketable. No ammonia or other products were procurable. Mr. Young was not in the habit of working by rule-of-thumb. He thought out a subject, and then proceeded to experiment upon a deliberately adopted principle. Thus, in considering the question of how to get the oil away from the retort as speedily as possible, the conclusion was reached that gravitation would be the simplest and most efficient method; and the vertical retort was evolved. An experimental retort was erected at the gas-works at Lasswade, with most gratifying results, which were still further enhanced when steam was applied to accelerate the process. The success of Mr. Young's experiment became at once a topic of remark among oil makers; and here Mr. Brash reappears—again as the good spirit. He had a leading interest in the Straiton Oil-Works, situated about a mile on the Edinburgh side of Lasswade. With his scientific knowledge, he, immediately on seeing Mr. Young's invention, perceived its value, and, being a man of means, which Mr. Young was not, he offered terms. An agreement was come to, on the basis of a joint patent and half the proceeds; Mr. Brash to finance the process, and Mr. Young to leave Lasswade to become Manager of the Straiton Oil Company, and to promote the engineering side of the patent. The process was universally adopted. Such was its success that very soon Mr. Young was able to sell out his share in the patent, obtaining £3000 for it; while Mr. Brash held on to his, and realized many thousands more. The patents, the first of the many which Mr. Young in his lifetime procured—there were two of them—were taken out in May, 1866. One of the essential elements of these patents was the return of the vapours and of the tarry matters evolved to the retort for redistillation—the first step in the evolution of the process of fractional distillation which he afterwards developed to such purpose. Pursuing his studies into the mysteries of retorting, Mr. Young strove to perfect his plant, so as to make it a more efficient vehicle for the recovery of both oil and residual products.

About 1874, Mr. Young was appointed Engineer to the Clippens Oil Company, and removed to their headquarters near Paisley. Straiton was, however, the place where he continued to do much of his scientific research. Into his laboratory there he introduced, as a handyman, Mr. Robert Mitchell, who, fired with Mr. Young's enthusiasm in scientific matters, became himself an expert scientist, and, entering the world of gas making, ultimately held the post of Manager of the Edinburgh Gas Company. Later on, Mr. Alex Bell, jun., now the Gas Manager at Peebles, having been sent home from Gibraltar by his father to prosecute his studies, was engaged by Mr. Young as his Assistant at the Pentland station of the Clippens Oil Company at Straiton—a connection which has remained almost unbroken to the present day. Mr. Young was then struggling with the idea of an enlarged vertical retort in which there should be zones of varying heat; and Mr. Bell was his right-hand man in the construction and working of the retort. The apparatus was so far perfected that, in April, 1881, Mr. Young applied for letters patent for an invention in which shale was subjected in the retort to two temperatures—the first, a comparatively low temperature for the production of oil of high quality; and the second a much higher temperature for the production of ammonia. Another worker in this field—Mr. George T. Beilby—then Chemist in the Oakbank Oil Company's works at Mid-Calder, and now residing in Glasgow—had arrived at the same conclusion; the two having been working independently of, and unknown to, each other, upon the same lines. Mr. Beilby applied for a patent a month later than Mr. Young; and then the discovery was made that there were two competitors for the same process. Subsequently (1882), the two inventors coalesced in the matter; and the Young and Beilby retort became, and remains, although modified in details, the standard retort for the distillation of shale. In its underlying principle is to be perceived another step forward in the development of the process of fractional distillation. The Young and Beilby retort having been, in the belief of the patentees, infringed, they felt themselves obliged to enter into litigation to protect their rights. An action was brought in the Court of Session, against the Hermand Oil Company, Limited. It was fought with much energy on both sides. The pursuers lost in the Court of Session, in both the Outer and Inner Houses; but on the appeal to the House of Lords, they were successful in vindicating their claim to the possession of a valid patent. In connection with this litigation, Sir Frederick Bramwell, on having the retort explained to him by Mr. Young, remarked that "it was the most perfectly thought-out thing he had ever seen." Mr. Young was now, from the royalties derived from this and other patents, a wealthy man; and in 1883 he retired from active management, and became a Consulting Engineer, going to live at Peebles, where he resided from 1882. While still in the full activity of his career, he patented a process for the manufacture of gazolene, the spirit which is now known as petrol. In its early days, however, there were no motor-cars, and an extensive use of the spirit was the carburetting of air for the production of illuminating gas. As early as 1877, he had his own house, and several of those adjoining, lighted by means of carburetted air.

Though retired from an official position, there was much work still before Mr. Young—work in which, perhaps, the readers of the "JOURNAL" are more interested than in that which has gone before. He contributed numerous papers to the North British Association of Gas Managers, which body, at their meeting in Stirling in 1892, elected him an honorary member, "in recognition of the great interest he has taken in the welfare of, and for the excellent services he has rendered to, the Association for so many years." At the meeting of the Association in Ayr in 1903, a paper by him was submitted, but, in his absence through ill-health, it was read by the late Mr. James M'Gilchrist, of Dumbarton, who, in speaking to the paper, said it had been suggested to him that, as a compliment to Mr. Young, the Association should ask his permission to publish, in book form, the various papers he had contributed to the Association, and that he heartily agreed with the suggestion. In the following year, the Committee of the Association reported that they had approached Mr. Young on the subject, and that he was very pleased to hear of the proposal; but he had written stating that he was afraid the publication must be in abeyance till he felt better able to do the necessary work. Unfortunately, he was never able to take up the matter; and the proposal is still in abeyance.

In 1892, the gas world was startled by the announcement in the "JOURNAL" of Mr. Young's discovery and patenting of a process for the manufacture of a permanent gas from oil. This subject, too, Mr. Young was led to take up by quite natural means. Mr. J. Fyfe, the Managing-Director of Young's Paraffin Light and Mineral Oil Company, Limited, reported to him that there was difficulty in getting a market for their heavier oils; and he asked him to endeavour to find out a process for converting them into gas. There had been for some years—chiefly owing to the scarcity and consequent high price of cannel coal—endeavours to carbonize oil and tar; but in every instance the difficulty was felt that the resulting gas was not permanent. Mr. Young took up the subject, thought it out, made up his mind upon it, and, with assistance of Mr. Bell, of Peebles, had a unit plant fitted up in the gas-works there. Its principles were two in number—the washing out of the vapours which were not permanent by the incoming oil, and the returning of these vapours to the retort, to be again subjected to heat—the application, again, of the principle of fractional distillation. In this way only permanent gas was drawn off. The Young and Bell patent was obtained in 1892, for what was named the "Peebles Process." It was adopted as an enriching process in a fairly large number of gas-works in Scotland; and the Oil Gas Enrichment Company, Limited, was formed to work it. The process was a pronounced scientific success, but a commercial failure, for which several reasons may be given. In the first place, the price of cannel came down, in three years, through its operation, from, in some instances, 45s. to 17s. 6d. per ton; about the same time, carburetted water gas began to be pushed; and then Mr. Young himself sought to improve his process by the introduction of another method of carbonizing, known as the "Second Peebles Process," in which an inside-fired vertical retort was used. The patent for this process was obtained in June, 1893. The process was installed in the Corporation Gas-Works at Paisley, and was there worked by Mr. George R. Hislop, whose son, Mr. R. T. Hislop, became Manager of the two processes. It is doubtful if the second process was ever adopted elsewhere than in Paisley. Mr. Young's health gave way chiefly owing to the strain of work he had had in connection with these processes. He regretfully remarked that he had attempted more than he was able to do; that he ought to have appointed a manager at the first; but that it was then too late. He never quite recovered; but he was still able to attend to the controversies of the day. One of these related to the prevention of naphthalene deposits. Upon this subject, as our readers are aware, he collaborated with Messrs. Thomas and Samuel Glover in bringing out a patent for a process by the use of which he claimed that practically complete immunity from naphthalene could be obtained. In 1897, he contributed, in conjunction with the first-named gentleman, a paper on "Naphthalene in Modern Gas Manufacture, and the Carburetting of Illuminating Gas;" and at the meeting of the Southern District Association in November, 1902, Mr. Thos. Glover read a paper, the joint production of himself and Mr. Young, on "Further Suggestions for the Elimination of Naphthalene from Coal Gas." On this occasion, Mr. Glover gracefully acknowledged that his part of the work had been confined merely to "editing" the matter supplied to him by Mr. Young. His latest work was upon a vertical retort for the making of coal gas, which was also the joint production of himself and Mr. Samuel Glover, of St. Helens. It was recently illustrated in the "JOURNAL," in the pages of which, it may be recalled, he also published, last year, a series of articles upon vertical retorts.* In the first of these, he gave an interesting account of his forty years' work in connection with the carbonization of coal and shale.

Mr. Young had taken out many patents, ranging over half-a-century; but some were not extensively worked. One of these may be mentioned—that for the purification of gas in closed vessels, which he described to the North British Association at the Stirling meeting in 1887. To the very last he maintained that this process could be worked to profit and advantage, but the gas managers had not the courage to take it up.

Mr. Young had been in feeble health for many years; but about the middle of April last he became worse, and for a time he was in a critical condition. Recovering somewhat, he was able to be taken to his country residence of Harehope, in the vicinity of Peebles, which he purchased a few years ago, and where he

* See Vol. XCIII., pp. 560, 714, 851; Vol. XCIV., pp. 95, 163, 758; and Vol. XCVI., p. 305.

erected a handsome dwelling-house. There he gained a little strength, but never got out of the condition of being an invalid. In the autumn he again became worse. He lay for a time there, and was then removed to his home at Priorsford. So late as a month ago, he expressed to Mr. Bell, of Dalkeith—his lifelong friend—his belief that he would pull through, though he did not expect he would ever be fit for any work. A fortnight later he told Mr. Bell he was done in every way, and had now no hope of being spared much longer. Last Sunday week he was unable to see Mr. Bell, but bade the nurse convey to him his love and farewell message. The same day he became unconscious, and he remained so until he passed away at half-past two on Friday afternoon. His remains are to be interred in Peebles Churchyard this afternoon.

Mrs. Young died in Edinburgh about five years ago. They had only one child—a son—who survives his father.

The following appreciation of the late Mr. Young is by one who was intimately acquainted with him, and who consequently had many opportunities of estimating the value of his long and busy life-work:—

Mr. Young's life strikes me in this way: The opportunity and the man. The opportunity, of course, was the potentialities of the shale-oil industry; the man was the manager of a small gas-works, but an idealist, a hater of waste, with a love of natural science inherited from a father who was also a gas manager.

The industry Mr. Young did so much to improve has now reached immense proportions, and is one of the most scientifically perfect; and because of the perfection of the methods employed and the low cost of manufacture, the shale oil companies are financially successful in spite of great competition. The history of the improvements he made in shale distillation are outlined in the articles he contributed to the "JOURNAL" a year ago.

Mr. Young never lost his interest in the gas industry; and while he was living the strenuous life of a Chemical Engineer and Oil-Works Manager, he frequently found time to contribute valuable papers to Associations of Gas Managers. Whatever he touched he tried to improve, and always endeavoured to get to the foundation truths underlying all phenomena.

He never lost his faith in the possibilities of completely purifying coal gas in closed vessels by the use of caustic ammonia liquor; and one can only regret that his failing strength and want of any suitable opportunity did not permit him to see his vision realized.

That Mr. Young, with his great experience, had faith in the vertical form of retort-setting, for economically producing coal gas, was sufficient to call for the investigation of this radical departure from conditions previously considered as essential. His last work for the gas industry was to assist Mr. Samuel Glover with the design of a vertical setting which has many characteristic features.

Mr. Young's early life was spent under Puritan influences; and although in manhood he rejected the dogma of creeds, he had a noble conception of life. He was the friend to many who were in need; and he was extremely high-principled.

PERSONAL.

On Wednesday last, Mr. JAMES M'LEOD, of Glasgow, was appointed Manager of the Kirkintilloch Corporation Gas-Works, rendered vacant by the translation of Mr. W. Wilson to Falkirk. Mr. M'Leod, a native of Dumbarton, has been for sixteen years in the employment of the Corporation of Glasgow, holding the position of Chief Chemist at Provan. He is at present President of the Scottish Junior Gas Association—Western District.

Mr. CHARLES PANCHEN, the Secretary of the Great Yarmouth Gas Company, retires from that position on the 30th inst. Mr. Panchen then completes 45 years of continuous service, having been apprenticed in May, 1862. He has filled the office of Secretary for the past 18 years. He retires with the heartiest goodwill and wishes of the Board; while the shareholders, at the annual general meeting of the Company on Monday of last week, granted the retiring allowance recommended by the Directors.

Mr. JOSEPH TOWNSLEY has been appointed Manager of the Ashton-under-Lyne Gas-Works, in succession to Mr. R. Hooton, whose connection with the undertaking has been severed. Mr. Townsley was, until three years ago, superintendent at Ashton, which position he occupied for about six years, and retired in order to take up an appointment as Works Foreman at the Birkenhead Gas-Works. Prior to his departure from Birkenhead on Saturday week, he was made the recipient of a gold watch chain, pendant, gold bracelet, and a purse containing money, subscribed to by the gas workers under his charge.

The Scottish Junior Gas Association—Eastern District—held a meeting in Edinburgh on Saturday, when two papers were read; one by Mr. J. W. Lill, on "Gas-Governors," and the other by Mr. W. B. Leech, on "Elevators and Conveyors." As, however, it was impossible to secure copies of the papers before the time of meeting, so as to prepare abstracts of them for publication, we are compelled to hold over our notice of the proceedings.

WILLIAM THOMAS SUGG.

IT is with sincere regret, which, we are sure, will be shared by a large number of our readers, that we record the death, early last Thursday morning, at his residence, "Morningside," Clapham Park, of Mr. William Thomas Sugg. Deceased had been unwell for some time—more or less, indeed, since the Earl's Court Exhibition; but he was able to attend to business at his Company's works in Regency Street, Westminster, on Tuesday, the 19th ult. He, however, gradually lost strength, and passed away in his seventy-fifth year.

Mr. Sugg was born in Westminster—a fact to which he always referred with gratification; and his close connection with the ancient city was unbroken, for at the time of his death he was a Churchwarden of St. John's. His father established in 1838 a gas meter and fittings business in Marsham Street, and under him, as an apprentice, and in the works of the South Metropolitan Gas Company, under the late Mr. Thomas Livesey, he acquired a knowledge of the manufacture of gas and the construction of the appliances used in its distribution. In 1858, he joined his father, and on the death of the latter in 1862 acquired the business. He had previously turned his attention to the improvement of gas-burners; and had made the first argand steatite-top burner, which was tested by the late Mr. Henry Banister, of the Gaslight and Coke Company, against his own iron-top burner, and found to be better. He also made in 1858 the first burner which might be considered as the standard burner used for the testing of gas in England; and he designed, in 1862, in conjunction with Dr. Letheby, an improved form of this burner, which came to be known as the Sugg-Letheby standard burner for 14-candle gas. Mr. Sugg commenced the manufacture of steatite flat-flame and argand governor burners; and on Sept. 5, 1866, he took out what appears to have been his first patent for an "apparatus for regulating the supply of gas." In 1868, another patent was obtained for a similar purpose; and in the following year, one for "improvements in gas-burners." His attention was not, however, confined to burners. From the time he joined the business he had been occupied in designing, manufacturing, and putting into operation all the most perfect apparatus used for testing the illuminating power and purity of gas. The passing of the Metropolis Gas Act in 1860 gave him excellent scope for the exercise of his skill in this direction; and he made the whole of the new testing apparatus which then came into use.

It will be easily understood that, under Mr. Sugg's energetic management, the business soon outgrew the premises in Marsham Street; and in 1867 it was transferred to Vincent Street—the larger works bearing the name of the thoroughfare in which they were situated. It is unnecessary to trace their development as the years went on, until they extended into Regency Street. To the construction of the photometrical and other gas-testing apparatus for which the establishment is known the world over, was subsequently added the manufacture of high-power and other street-lamps, fittings, gas-fires, and gas cooking-stoves and ranges. Until the advent of the electric light in 1878, high-power street-lamps were unknown; but early next year Mr. Sugg demonstrated on Waterloo Bridge and a portion of the road, as well as in Waterloo Place, Pall Mall, what such lamps were capable of producing, with ordinary gas, in the way of illumination. The bridge and road were in the district of the then Phœnix Gas Company, of which Mr. Corbet Woodall was the Engineer; and it was due to his initiative that the demonstration there took place. Waterloo Place was, of course, in the district of the Gaslight and Coke Company. A year or two later came the Electric and Gas Exhibition at the Crystal Palace, where Mr. Sugg had an opportunity of proving, to all who were willing to be convinced, that gas, properly used, was not the effete illuminant which the electricians were trying to make people believe it was. He showed that, far from being moribund, there was a good deal of life in it.

In the summer of 1881, it was found that the business had assumed such proportions that it would be advisable to form a limited liability company to conduct it; and this was accordingly done. In addition to the works in Westminster, show-rooms were opened in the Grand Hotel Buildings, Charing Cross, and branches were established in Paris and elsewhere. But the London and Paris branches were given up later, and the business was concentrated in Regency Street. It did not, however, stagnate. Though a firm believer in the method of gas lighting with which he had been identified, Mr. Sugg nevertheless, when the time came, took up the incandescent system, and carried out some highly effective installations. Indeed, one of his latest patents (which ranged over about forty years) was for "compressing gases, and lamplighters' torches." Mr. Sugg was far too good a man of business to hide his Company's lights, whether high-power gas or incandescent mantles, "under a bushel." On the contrary, he showed them off wherever there was an opportunity of doing so advantageously; and the effective display made by him at the two Crystal Palace Exhibitions, as well as at the more recent one at Earl's Court, will be fresh in the recollection of many of our readers.

Mr. Sugg's contributions to the literature of the industry with which his life-work was so closely associated were numerous. Much has been heard lately about the sulphur question; and therefore it is interesting to record that the year Mr. Sugg rendered valuable service to managers of gas-works in 1865 by

publishing a series of tables showing at a glance the quantity of sulphur present in 100 cubic feet of gas by the combustion of from 10 to 30 cubic feet, and by the collection on the filter of any quantity of sulphate of baryta, from 1 to 67 grains. By these tables, the necessity for making calculations was avoided. He came before the British Association of Gas Managers in the early years of the organization, as he assisted Dr. Letheby at the first lecture delivered by him before that body. At the sixth annual meeting, held in Liverpool in 1869, Mr. Sugg read a paper on "Gas-Burners," in which he gave the results of comparisons of a number of burners with the "London" argand, made by him in 1861, and adopted by Dr. Letheby for testing the gas supplied to the City. He recommended that, in making a test of any gas, the flame should be maintained always at a height of 3 inches, and that correction should be made for any variation in the standard consumption of 5 cubic feet in the usual way. By this method the "London" argand could be used for any quality of gas up to 18 candles. The burner, as already stated, was accepted as the standard for 14-candle gas, and it has only lately been displaced by the "Metropolitan" burner No. 2. Next year Mr. Sugg was again before the Association—this time in conjunction with Mr. T. N. Kirkham—with a paper on "Photometry as Applied to the Estimation of the Value of Coal Gases." In this he brought under notice the new Evans lamp photometer, which, while dispensing with the use of candles, enabled an operator to convert the terms of the lamp into those of candles without any calculation. In 1873 he dealt once more with the subject of the consumption of gas, in a paper on "Standard Gas-Burners." It was not read, owing to want of time; but, of course, it was given in an appendix to the "Transactions" that year. The author recorded how his first studies in connection with standard burners commenced in 1858, and how, noticing the variations in those then in use, he was led to construct his 12-candle burner. Four years later, he called the attention of the members of the Association to the subject of "Lighting Railway Trains with Coal Gas at Low Pressures," in a paper which he was unable to read in person. He thought the subject worthy of consideration by gas companies, as a railway coach would, in his opinion, be quite as good a customer as a number of small consumers using five or six lights, and certainly would not give so much trouble in repairs to meters and services. In 1878, the gas industry was roused from its tranquillity by the adoption of the Jablochkoff electric "candle" for lighting the Avenue de l'Opéra in Paris; and in the following year Mr. Sugg was to the fore with a paper on "Lighting by Gas and Electricity." In it he described what the Paris Gas Company had done in the way of improved gas lighting in the neighbouring thoroughfare, the Rue du Quatre Septembre, and in other parts of Paris, and gave some valuable statistics as to the lighting of Queen Victoria Street and Waterloo Place with his new large burners and lanterns, in comparison with the cost of the electric lighting of the Avenue de l'Opéra. He concluded his paper with this remark: "Gas lighting is a progressive science; and if electricity has been galvanized into renewed life by those very ingenious gentlemen, Messrs. Denayrouze and Jablochkoff, so have we gas engineers received the *contre-coup* of the shock. We may fairly say that we are not behind in that race which will inevitably result in conferring upon mankind one of the most cherished of blessings—more light." How true! Gas lighting *is* "a progressive science," as evidenced by our columns week after week.

A few years later—in 1882—the Association was transformed into the Gas Institute; and at the first meeting of the new body, held in London under the presidency of Mr. G. W. Stevenson, Mr. Sugg read a useful paper on "The Application of Gas to the Lighting of Open Spaces and Large Buildings," in which he showed pretty clearly that—to use his own words—"gas is steadier and readier, and more useful for the purpose of lighting large interior and exterior spaces, than electricity." And not a few public authorities and proprietors of large establishments have—somewhat tardily, perhaps—come to a like conclusion. Having disposed of the question of outdoor lighting, Mr. Sugg turned his attention to interiors; and at the meeting held in Manchester in 1885, under the presidency of Mr. Thomas Newbigging, he read a paper on "Lighting and Ventilating Ordinary Apartments by Gas." He showed that with a proper burner it is possible to obtain perfect combustion without smoke, and by the substitution of gas for coal fires to have warmth without dirt and discoloration. In referring to the paper, the President said Mr. Sugg had chosen an exceedingly appropriate subject, and had handled it in a way which was at once simple and attractive, so that he who ran might read. After this a rather long period elapsed before Mr. Sugg appeared again as a contributor to the proceedings of the Institute. But at the meeting in 1895 he submitted, but did not read, a paper on "Photometry as Applied to the Verification of the Illuminating Power of Gas Supplied to Towns." Towards the close of the paper, he said he understood that there was a proposition emanating from the Standards of Light Committee to use the Gas Referees' standard "London" argand burner in the manner in which it was proposed to be used by him many years previously in the paper he read before the British Association of Gas Managers. He condemned the use of flat-flame burners for testing gas of any quality; for, however useful they were to the consumer, they were not suitable for testing the illuminating power of gas. "An argand burner," he said, "is the only one which can be relied upon to maintain a steady vertical light in a photometer, and to give fair comparative results, should the quality of the gas vary a candle or so up or down." The next year Mr. Sugg returned to the subject, in a paper entitled "Photometers and Standards of Light," in which some highly interesting historical information, fully illustrated, was presented. His paper was preceded by one on "A Standard Photometer," by Mr. W. J. Dibdin; and the two were discussed together. At the meeting in 1897, he took up, in one paper, two other favourite subjects—"Cooking by the Aid of Gas, and the Ventilation of Kitchens," and directed attention to the roaster used by M. Jules Gouffé, the *Chef de Cuisine* to the Jockey Club in Paris. The next appearance of Mr. Sugg was in 1901, when he read a paper on "High and Low Pressure Incandescent Lighting." This contribution not only showed, as its auther had stated years before, that gas lighting is "a progressive science," but that he was quite abreast of the progress it had made.

A change in the constitution of the Institute, by its amalgamation with the Institution, took place shortly after this; and at the first meeting of the united body, Mr. Sugg reverted to the subject just named, in a short paper on "High-Pressure Gas Incandescent Lighting," in which he described the lighting on the Tower and Blackfriars Bridges and at several railway stations. Next year he read a paper on "Artificial Gas Illumination in Relation to Natural Light," in which he emphasized the point that those who use high-power burners should shade their eyes from the direct rays. This was Mr. Sugg's final appearance. At the time of the meeting last year, it may be remembered, he was very ill; and during the discussion on Mr. Carpenter's paper, "Notes on the Argand Burner," Sir George Livesey, referring to Mr. Sugg's usually regular attendance on such occasions, suggested that the members should express their sympathy with him in the illness which prevented him from being with them. The suggestion was received with cries of "Agreed, agreed." In acknowledging the message, Mr. Sugg said he regretted that the succession of colds he had taken since the Earl's Court Exhibition had prevented him attending the meeting, joining in the *conversazione*, or accompanying the members on the excursion to Boulogne, where he would have offered his services as interpreter. As many of our readers are aware, he spoke French fluently.

The foregoing list of Mr. Sugg's contributions to the literature of the gas industry, comprehensive as it is, is by no means exhaustive. In 1869, he read a paper before the Society of Engineers on "Apparatus Employed for Illumination with Coal Gas," and in 1895 one on "Ventilation and Warming." Early in 1879, he exhibited at the Society of Arts the new system of street lighting by high-power burners and lamps which was then being tried in London. In 1892, he made a communication to the Southern District Association on the subject of the "Pentane Standard." From time to time he found himself upon the lecture platform discoursing upon the advantages of gas for cooking and heating. Early in 1880, he gave, before the Hull Literary and Philosophical Society, a lecture on "The Scientific Use of Coal Gas." In January, 1882, he read a paper on "The Use of Gas for Lighting, Heating, and Ventilation," during the Smoke Abatement Exhibition; and in the summer of the same year, one before the Association of Municipal and Sanitary Engineers and Surveyors on "Gas as an Illuminating Agent Compared with Electricity." Early in 1887, he gave some demonstrations in high-class cookery in the Westminster Town Hall; and later in the year, he lectured before the Liverpool and District Association of Science and Art Teachers on "Recent Improvements in Gas Lighting." The next year, he showed at the works in Westminster a combined system of gas lighting and ventilation which evoked high commendation from so thoroughly practical a gas engineer as the late Mr. William Mann. In addition to his other qualities, Mr. Sugg was an author. He enlarged the late Mr. Henry Banister's "Gas Manipulation," and the book was published in 1867; and in 1884, he brought out a work entitled "The Domestic Uses of Coal Gas, as Applied to Lighting, Cooking and Heating, and Ventilation," which contained a number of suggestions to consumers of gas on the best mode of fitting up houses and using gas to the greatest advantage. He also issued annually, after the formation of the Company, a useful "Gas Engineer's Pocket Almanack and Lighting Table."

Being a patentee, a manufacturer, and the manager of a large business, Mr. Sugg was, like other men similarly situated, compelled to defend his interests in the Law Courts. These troubles, however, are now matters of history, and may, at such a time as this, well be left for those who are specially concerned with them to investigate by the aid of the records in our pages. We refer only to the work done by Mr. Sugg for the gas industry at large; and if a monument to it is required, it will be found, like Wren's, by looking round. It can be truthfully said that there is hardly a town in which gas lighting is employed that does not contain a burner or some piece of testing apparatus bearing the name of the indefatigable worker who has just been removed from the sphere of his activities. His monument, therefore, is truly universal. His services were recognized by his election in 1873 as an honorary member of the British Association of Gas Managers; and on the amalgamation of the Gas Institute with the Institution of Gas Engineers he retained this position. He was elected an associate of the Institution of Civil Engineers in 1862, and contributed to the "Proceedings" a paper for which he received a Telford Premium. He was also a member of the Royal Institution. He was an enthusiastic Freemason, and was a Founder and the second W. M. (1880) of the Evening Star Lodge, 1719, and also a member of the Britannic Lodge No. 33 and P.P.G.S. of W. (Surrey).

The sketch of the life-work of the late Mr. Sugg here presented

does not include many interesting incidents which will, no doubt, recur to the minds of those who knew him. But sufficient has been said to show that by his death the gas industry has lost one of its prominent members, who never ceased to believe in its stability, or missed an opportunity of upholding it; and a large circle of private and professional friends have been bereft of one whose qualities of head and heart rendered him, in every sense, worthy of their highest esteem.

Mr. Sugg was twice married, and he leaves a widow and several sons and daughters. The funeral takes place at two o'clock to-day, at Streatham Cemetery, Garratt Lane, Tooting; the interment being preceded by a service at the Church of the Ascension, Malwood Road, Balham, at one o'clock.

Profit-Sharing in America.

A letter lately received from a correspondent shows that profit-sharing, mainly on the lines laid down by Sir George Livesey, has been started by a few gas companies in the States. In Derby (Conn.), it has been in operation since 1902; and now practically every employee is a stockholder. The Boston Company started it last October; and it has just been adopted in New Haven. The President of the Gas Company in that town (Mr. C. H. Nettleton), after a study of the subject extending over three years, decided to put into operation a profit-sharing scheme in which all the employees, except the executive officials, could share, provided they had been in the service for a twelvemonth. The proposal received the hearty support of his associates. Under the scheme, the sum of 8 per cent. is credited quarterly upon the wages paid during the preceding three months, and when the total amount credited to an employee equals the market value of one or more of the Company's shares, a certificate representing the amount is registered in his name. The stock becomes his personal property, and he may do with it as he sees fit, provided he offers it for sale to the Company before putting it upon the market. The only restrictions in regard to the operation of the plan are these: If an employee is discharged for any cause, except drunkenness, insubordination, commission of a crime, or destruction of the Company's property, he will receive his balance in full; but if he is discharged for these causes, or any of them, he forfeits the entire balance. If an employee voluntarily leaves the Company, one-half of the amount of the credit is paid in cash, except in the case of a woman leaving on the occasion of her marriage, in which event the Company will pay the full amount of the balance. In case of the death of an employee, the balance is paid in full to his legal representative. Mr. Nettleton thinks that the Company receive a full return for all the scheme costs, to say nothing of the greater comfort and pleasure of the employees; and he says he will be surprised if the system does not extend with considerable rapidity.

Analyses of Accounts of Gas Undertakings.—We have received the "Gas World" analyses of the accounts of gas undertakings for the year 1905-6. They are contained, as before, on four large sheets (linen-backed for strength), bound in stiff cloth cover, and relate to 114 company and municipal undertakings—being one more than in the analyses for the preceding year. There are three new entries—the Calverley and Waterford Gas Companies and the Nantwich Urban District Council. But, on the other hand, the Mossley and Ripon Corporations drop out. The left-hand sheet of analyses furnishes particulars relating to the quantity of coal carbonized and of gas made and sold, the yield of residuals, the numbers of public-lamps and consumers, and the length of mains, as well as details in regard to price, illuminating power, and revenue. On the right-hand sheet will be found statistics in regard to manufacture, distribution, and management, the capital paid up, and the capital per ton and per 1000 cubic feet of gas, &c. As in previous analyses, the eye is assisted in following the figures by means of faint blue lines dividing the whole of the names into groups of three, as well as by the repetition, on the inner margins of the sheets, of the figures showing the numerical order.

Assessment Appeal by the South Metropolitan Gas Company.—At the Sessions House, Clerkenwell, last Thursday, an appeal was opened, before Mr. Robert Wallace, K.C. (Chairman), and a Bench of Magistrates, against the assessment of the South Metropolitan Gas Company's works by the Assessment Committee of the Greenwich and Woolwich Unions and of the Bermondsey and Lewisham Borough Councils. The case for the appellants is being conducted by Mr. Balfour Browne, K.C., Mr. Danckwerts, K.C., and Mr. Ryde; and the Counsel for the respondents are: For the Greenwich Union, Sir Ralph Littler, K.C., Mr. F. Marshall, K.C., and Mr. R. C. Glen; for the Woolwich Union, Mr. Cripps, K.C., Mr. Horace Avory, K.C., and Mr. E. W. Cox-Sinclair; for Bermondsey, Mr. Horace Avory, K.C., and Mr. R. W. Harper; and for Lewisham, Sir Edward Boyle, K.C., and Mr. Tyrrell T. Paine. After Mr. Balfour Browne had opened the case, Mr. A. L. Ryde was called, and he was under examination the remainder of the first day and part of the second. He was followed by Mr. W. A. Valon; and on Saturday Mr. E. H. Stevenson and Mr. Frank Bush gave evidence. At the rising of the Court, the further hearing was adjourned *sine die*. Owing to the crowded state of our columns, our report of the proceedings so far has to be held over till next week.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 641.)

THINGS really took a turn for the better on the Stock Exchange last week; but it did not come all at once. The opening was rather irregular—some leading markets being flat, though Home Government securities were rising. But by mid-week, even the flatter lines began to recover—notably the much depressed Railway Market—and a spirit of cheerfulness began to infuse the Exchange generally. That welcome guest, the investor, was in evidence; and his presence improved prices. The favourable turn lasted up till the close of the week. It is said that the brighter view was, to a considerable extent, engendered by confident anticipation that the Municipal Reformers would score a victory in the London County Council elections on Saturday. As they have done so, and splendidly, unless the full magnitude of the actual result has been already discounted, a still further recovery in values ought to be achieved this week. In the Money Market, there was a strong demand for the month end and for the Stock Exchange settlement, and pretty stiff rates were realized; but by the close of the week, money became abundant and easy. Discount rates held firm and unchanged. Business in the Gas Market was not up to the average of last week in point of volume, but rather on a par with the calm which marked the later portion of that period. The tendency on the whole appeared to be pretty steady; and there was hardly any change in the quotations, except those arising from the adjustments upon *ex div.* quotation. Of these, there were a great number; and in most of the instances where a fraction was involved, it went in the lower direction. The exceptions to this rule were mostly to be found among high-class Provincial undertakings. In Gaslight and Coke issues, the ordinary was only moderately active, but was again remarkably steady—transactions being uniformly within the narrow limits of $95\frac{3}{4}$ and $96\frac{1}{2}$, the identical figures of the preceding week. In the secured issues, the maximum was marked at 89, the preference at $106\frac{1}{2}$ and 107, and the debenture at from 84 to $85\frac{1}{2}$. South Metropolitan was very little dealt in; two or three bargains between $124\frac{3}{4}$ and $125\frac{1}{2}$ being all the business done. The debenture changed hands at $85\frac{7}{8}$ and 86. Commercials were quiet at 110 *cum div.* and $109\frac{1}{2}$ *ex div.* for the 4 per cent., 108 *cum div.* for the $3\frac{1}{2}$ per cent., and 83 and $83\frac{1}{4}$ for the debenture. Among the Suburban and Provincial group, Brentford old marked 252 *ex div.*, British $42\frac{1}{2}$, Hastings $3\frac{1}{2}$ per cent. 102, South Suburban 121 *ex div.*, Wandsworth debenture $79\frac{1}{2}$ free, West Ham $103\frac{1}{2}$ *ex div.*, and ditto debenture 104. In the Continental Companies, Imperial was steady at from 180 to $180\frac{3}{4}$, Union was not dealt in, European fully-paid marked $24\frac{3}{4}$, ditto part-paid $18\frac{3}{8}$, and Tuscan from $10\frac{5}{8}$ to $10\frac{3}{4}$. Among the undertakings of the remoter world, Buenos Ayres was done at $11\frac{3}{4}$, Primitiva at $7\frac{15}{16}$ and $7\frac{9}{32}$, ditto preference at $5\frac{1}{8}$ and $5\frac{3}{16}$, ditto debenture at from $95\frac{1}{4}$ to $96\frac{1}{2}$, River Plate at from $12\frac{3}{8}$ to $12\frac{1}{2}$, and San Paulo at $13\frac{1}{4}$ and $13\frac{5}{16}$.

The closing prices are shown in our list on p. 641.

ELECTRIC LIGHTING MEMORANDA.

The Difficulties of Power Development—Conservatism Blocks the Way—A Ray of Hope—The Erratic Character of Existing Business—From Charing Cross Eastward to Poplar.

LIGHTING topics will be avoided this week, in order to give place to some information, concerning electricity supply for industrial and other purposes, which will be of general interest and use, though the illustration is drawn from London experiences. In the "Memoranda" last week, it was shown, from recently published statistics, that the experiences of the existing electricity suppliers in London do not support the glowing anticipations of the estimates of the promoters of big power schemes. The business for power is not there to be done to the extent shadowed forth by what are largely guesswork figures; and what there is that is really worth having, is purely local—the remnants being of small importance, owing to their intermittent character and the vacillations in the quantity of energy required. In the industrial centres, too, the business is difficult to obtain—anyway, that is the experience of Sir William Preece, according to remarks he made at the last meeting of the London Electric Supply Corporation. The difficulty takes human form in the impassive, old-fashioned engineer of the present day. Conservatism curbs his progress and appreciation; and he has an innate liking for things that were preferred by his grandfather and his great-grandfather. That is what we understand as the drift of Sir William's remarks. Engineers of to-day will not approve of that gentleman sitting in judgment upon them in this fashion, and denying the possession of any intelligence in engineers other than those who have electricity to sell and those who, for their special requirements, are convinced that electrical motive power is the best for them. The same eminent gentleman accuses all who are not of his way of thinking on this question of electricity for power purposes, of being unable to appreciate an important theory in the science of industrial finance—that is, the art of scrapping. However, this is all to be

changed when the modern engineer comes into power—that is to say, after Sir William and his contemporaries have shaken the dust of this inappreciative world from off their feet. The proprietors of the Electricity Companies who have been induced by the prophets to look for great things from the supply of electricity for power purposes can now only sit patiently, and nurse their envy for posterity. However, there is one hope (frail it may be) for something more being done in London in the immediate future, if Parliament will sanction—instead of giving over the power supply to the London County Council or a separate Company—the combination of the thirteen Electricity Companies, so as to bring about the unification of their heterogeneous systems of production and distribution. Herein is the hope of salvation. But if the Companies cannot achieve anything notable under the present conditions, when they are supplying in some cases under scales of charges lower than the figures produced by the promoters of special schemes for power and bulk supply, how can they cherish the hope of making much greater headway by unification? We would, however, prefer unification and systematized supply, realized in this manner, to the waste of millions by imposing upon London one of the fresh nebulous schemes that are awaiting the final judgment of Parliament.

The experience of the existing suppliers, as we have said, is that there is not the business to be done in London to justify materializing any new project other than the developing of the existing undertakings separately or in combination. The provision of an additional electricity supply undertaking, however august, will not induce manufacturers to come to London and leave centres that are more favourable for their industry. Besides, ground values, rates and taxes, and living accommodation for labour are all too high in London to induce the further great concentration of industry there. The statistics quoted last week show that, favourable prices (as electricity costs go) for power notwithstanding, the undertakings have not accumulated a large business in this direction. In a series of articles in the "Electrician," Mr. R. L. Pearson is doing his best to drive a wedge into the popular fallacy that the Metropolis is a happy hunting-ground for electric power suppliers, and to prove the progress that the present stations have made in trying to provide an efficient supply of electrical energy commensurate with demand, without the elaboration and expenditure now projected. Of course, in this matter, we do not overlook the fact that at the prices charged for power—particularly to those customers whose consumption is intermittent and erratic—the lighting consumer must suffer. But, at the same time, we do not believe the lighting consumer would be any the better off if the whole of London's electricity supply was centralized in one single concern; for there remains in memory prices named in agreements effected by power companies in which the lighting consumers have not received any greater consideration than is extended to them by existing concerns. As competitors, gas suppliers have no cause to defend private electricity consumers for lighting purposes. For gas suppliers, the present procedure in this regard of their electricity competitors works very favourably.

It is edifying to take a glance at some of the illustrations given in the articles referred to as to the business done in power, the prices charged, and as to the doubtful character of some of this business from the profit-bearing point of view. There is the Charing Cross Company. The increase of motor connections in their case in 1906 equalled in the West-end 933-horse power (total 5079), and 863-horse power (total 4731) in the City. And what does the author of the articles tell us about this increase in motor connections? It is disappointing, owing principally to the nature of the work for which motors are employed in the Company's area. Newspaper printing-works require a "great deal" of power from the mains; but their load-factor is exceedingly poor—in fact, an average lighting load would be greatly preferable. One example of the nature of the business is of a consumer who only runs his motors fully loaded on two separate occasions of about one hour per week. The result of such custom is that the increase of 22·4 per cent. on the motor connections during the twelve months has lowered the load-factor from 13·6 to 12·5 per cent. This is not what the electricity supplier wants; and Mr. Pearson, in his comments, very properly says it is difficult to see how such consumers can be offered rates sufficiently low to take a supply at all. Yet apparently they are being offered fancy low prices, which have in cases the desired effect; and only one deduction is to be made from the action of the suppliers. To say the least, it is a queer kind of business. But the great point is, for present consideration, that the Charing Cross Company do supply at a lower rate than that proposed by the London County Council in their scheme for purely manufacturing purposes.

We cannot deal here completely with all the points raised in the articles Mr. Pearson is contributing to our contemporary; but there are a few more particulars to which we should like to call attention. The City of London Company occupy a peculiar position among electric supply undertakings. After business hours, life in the City dwindles rapidly to its lowest point. The Company's peak-load is at about five o'clock in the afternoon; and it is not therefore to be marvelled at that they feel somewhat bitter over the successful competition of gas for public lighting. The Gaslight and Coke Company have the same experience as to the diminishing character of the night business in the City; but, unlike the City of London Electric Supply Company, they have an area of which the City forms only a small part. However, the Electric Supply Company boast that they have already captured about two-thirds of the total power load "available" in the City; and as what they have captured resolves itself into connections equal to 12,000-horse power, and as the Charing Cross Company have a connection equal to 4731-horse power, there is, if the boast was made in sober moments, not much left for anyone else, nor is there any great prospect for further electrical, or any other kind, of power development in the City. The statement is made that the largest consumers for power are the newspaper printing-works, following them are cold-storage plants, and then elevators. "Certain of these" are said to account for 800 to 1000 horse power each; so that it may be inferred the number of consumers is not a considerable one. In passing, it is noted that the Company estimate there are 2000 four-lamp radiators linked up to their mains; and on cold days, the radiators increase the load to as much as 500 kilowatts. It may be taken from these and the preceding statements that the business of the Company subsidiary to that of lighting is of a very erratic character. There are the printing-works connections. From what has been said concerning the Charing Cross Company's business in this direction, the demand by printing-works must also be for the City Company of a very fluctuating character; and the connections for cold storage purposes, we take it, only periodically draw upon the mains. The radiators are off during the summer when the Company above all electricity companies could do with their friendly assistance. As to prices, it is observed that the Company charge 1½d. per unit for power during the daytime, and 1d. for night purposes, which looks like a reversal of the general practice. The day being the time when work is most brisk in the City, it would naturally be supposed (applying commercial principles to the sale of electricity) that the lower price would obtain at times of greatest opportunity for the encouraging of custom and consumption. We fail to see the sense of trying to encourage further custom by special rates when business is for the most part suspended in the City. For radiators, the charge is 1½d. per unit.

Travelling still eastward, we have in Poplar an industrial area, and so the scope for power business should be big there, both for low-priced electricity and for the cheap gas of the Commercial Company. And if credence could be given to all that is said, we should nurse the opinion that the Poplar electricity undertaking was really doing marvellously well in this line. It is gathered from the articles, that canvassing for power is going on there briskly; private electrical plants are being turned out; steam plants are being scrapped; in spite of extremely keen competition, gas-engines are following steam plants into oblivion with equal rapidity; and suction-gas plants are also being displaced. It is further stated that, in the quarter ending March, 1905, the consumption of electricity for power was about 200,000 units; it had risen to 400,000 units by March, 1906; and it is anticipated that a further 100 per cent. will be the increase by the end of the present quarter. But after reading all this, on turning to the statistics issued annually by the "Electrician," it is discovered that the return made quite recently showed a total connection of motors equal to 3601-horse power. "Connection" and "demand" are not, be it remembered, synonymous terms. The sliding-scale of charge is in vogue in Poplar; the maximum charge being 1½d. per unit, decreasing to 0·8d. as the load-factor rises—each case being considered on its merits. At St. Pancras, it is seen that the maximum charge for power is 1d. per unit; and factories using current for power are allowed to light up their premises at the 1d. per unit rate up to 20 per cent. of the number of units used for power. At this point we must leave Mr. Pearson's interesting articles; but an opportunity may occur for returning to them.

Incandescent Gas Lighting on German Railway Trains.

According to statistics quoted by "Der Gastechniker" from the "Metallindustrie Rundschau," incandescent gas lighting is proving very satisfactory in German railway carriages, and must shortly effect an important change and economy in the gas consumed in lighting the trains. Oil-gas used with incandescent mantles yields four-and-a-half times the light obtained from the mixed gas (acetylene and oil-gas or coal-gas) at present commonly used; and as it is anticipated that by the year 1909 all the carriages will have been provided with incandescent burners, the employment of the mixed gas will by that time have been entirely given up. The mixed gas costs nearly twice as much as the oil-gas. The consumption of mixed gas would in 1909 have reached about 10 million cubic metres (= 35 million cubic feet) per annum; but in its stead 7 million cubic metres of oil-gas will suffice—assuming that incandescent burners are employed. The saving thus effected on the cost of gas alone would amount to about £190,000 per annum. The cost of mantles, however, has to be met; and allowing for this, the net saving effected by the change is estimated at about £165,000 per annum. The cost of oil-gas is taken at a trifle over 9s. per 1000 cubic feet.

Recent Wills.—The late Mr. I. A. Crookenden's will has been proved, and the personalty is valued at £27,834. Mr. Edward Armitage, of Huddersfield, the Chairman of the Longwood Gas Company, whose death was recorded in the "JOURNAL" for Jan. 8, left £81,883. Mr. Robert Morland, for many years Engineer and Manager of the Gloucester Gas Company, left estate of the gross value of about £36,000.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of the Association was held on Thursday last, at the Grand Hotel, Birmingham. The retiring PRESIDENT (Mr. Fletcher W. Stevenson, of Coventry) occupied the chair at the opening of the proceedings.

CONFIRMATION OF MINUTES.—THE LATE MR. REEVES.

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held at Birmingham on Oct. 25 last; and they were unanimously carried.

The PRESIDENT said, arising out of the minutes, he would ask the Hon. Secretary to read a letter received from Mrs. Reeves, of Bilston.

The Hon. Secretary read the letter as follows:—

Dear Mr. MEIKLEJOHN,—Will you please convey my thanks to the Midland Gas Association for their kindly sympathy in my great loss. The many tokens I have received of the esteem in which my dear husband was held by his fellow-members does somewhat comfort me; and I rightly appreciate their sympathy. Again please thank them very much for me. Yours with kindest regards, in which I feel as speaking for him.—Yours very sincerely, FRANCES REEVES.

NEW MEMBER.

The HON. SECRETARY announced the election of Mr. W. W. Townsend, of Hereford, as a member of the Association.

ANNUAL REPORT AND ACCOUNTS.

The PRESIDENT moved that the annual report and the statement of accounts be received and adopted.

Mr. A. COOKE (Oldbury) seconded the motion, which was carried unanimously.

The report consisted chiefly of a review of the year's proceedings. In the concluding paragraphs, the Committee regretted to have to report the deaths of three members during the year, Mr. J. S. Reeves, of Bilston, a Past-President of the Association, Mr. J. H. Parsons, of Oswestry, and Mr. T. R. Collins, of Stony Stratford. Eight new members joined during the year, three ceased to be members under rule 13, and one member resigned; leaving the present number on the books 108. The statement of accounts showed a balance in hand of £123 9s. 4d.

RESIGNATION OF THE PRESIDENTSHIP BY MR. J. H. BROWN.

The PRESIDENT remarked that, before introducing Mr. Hubert Pooley, of Stafford, he would like to ask the Hon. Secretary to read a letter that had been addressed to him by Mr. J. H. Brown, of Nottingham.

DEAR SIR,—Permit me to express my very great regret that I have been compelled to resign the presidentship of this Association.

The Association doubtless considers that an explanation is due from me for resigning at so short a period after election; and in order that the members may realize that I have not broken faith with them, at least some explanation is certainly necessary.

I beg now to say that, when it was first suggested that I should accept the vice-presidentship, I at once obtained the approval of my Committee before accepting the honour. At a later date, when the time came for me to take the chair, I again brought the matter before my Committee; and they most readily consented to me taking the presidentship, and congratulated me on the honour the Association had conferred upon the city of Nottingham and myself. The Committee also gave instructions for a resolution to this effect to be entered upon the Committee's minutes; and I was also instructed to invite the Association to Nottingham for the annual meeting—the Committee having decided to entertain the members.

On the appointment of the new Committee in November—seeing that four new members had been added, and a new Chairman appointed—I again brought the matter before the Gas Committee for their confirmation of the invitation. The Chairman, however, protested against me taking the presidentship, on the ground that it would occupy too much of my time; and therefore I had no alternative but to resign the presidentship.

I exceedingly regret that such a course was necessary, and also the inconvenience the Association and the new President have thus been put to.

After this explanation, the members will, I trust, readily see that no other course was open to me under the circumstances, and that they will absolve me from any blame.

Wishing the Association and the new President a successful year.—Believe me, yours very truly, J. H. BROWN.

The PRESIDENT said he was sure the members would feel—as the Committee did, when they first received Mr. Brown's intimation that he could not accept the presidentship of the Association—the greatest disappointment and regret that circumstances should have arisen in Nottingham that prevented Mr. Brown from continuing in office. They had looked forward to him being their President for this year, and with pleasure and anticipation to his address, and to probably a visit to Nottingham to see what he was doing there. The Committee of the Association felt considerably hurt that a Gas Committee should think that their chief official would not be able to undertake his duties in connection with their own affairs, in addition to the presidency of the Association. He (the President) thought he might say it had always been looked upon as a mark of great respect and flattery when the compliment was paid to the chief engineer of a gas undertaking of being selected as President of the Association. The course adopted by the Gas Committee of Nottingham was altogether inexplicable to the Committee of the Association, as it would be to the members. They were not there to decide points between the Gas Committee and their Engineer; but the members would certainly wish to agree with him (the President) in expressing the greatest regret that Mr. Brown had to take this step, and that he was forced into it. Mr. Brown, he knew, felt the utmost regret that he could not continue as President of the Association. However, it became necessary for the Committee to select a successor; and the natural course of events was that the Vice-President should succeed to the office. He was sure, though they regretted that Mr. Brown could not remain in office, the members would heartily welcome Mr. Pooley as President of the Association. [Hear, hear.] Mr. Pooley was not a novice in these matters. He had already been President of another Association; and he (Mr. Stevenson) was quite confident he would worthily maintain the record of the Midland Association, and that he would be a useful President. He was certain they would give Mr. Pooley a most hearty welcome.

Mr. POOLEY took the chair amid the acclamation of the members.

THE BENEVOLENT FUND OF THE INSTITUTION OF GAS ENGINEERS.

The PRESIDENT called upon the Hon. Secretary to refer to a matter regarding the Benevolent Fund of the Institution of Gas Engineers.

The HON. SECRETARY said the members would recollect that, with the circulars sent out for the meeting, was a copy of a letter received from Mr. W. T. Dunn regarding the Benevolent Fund of the Institution. He daresay the members were aware of the fact that, on two occasions the Midland Association had been indebted to the fund for help to some of their members or their relatives. When the late Mr. Fryer, of Market Harborough, left his widow and children in trying circumstances, the benevolent fund came very quickly and beneficially to their aid. At the present moment, they had the widow of a late member of the Association who was in receipt of 10s. a week from the benevolent fund. As a matter of fact, the amount that this one lady received was about double the total subscriptions of the members of the Association to the fund. The fund, therefore, rightly had a claim to the consideration of the members; and he (Mr. Meiklejohn) would be delighted, and so, he was sure, would be the Council of the Institution, if the members would take to heart that this was a cause worthy of their support.

The PRESIDENT then delivered his

INAUGURAL ADDRESS.

Gentlemen,—On the 2nd of January I received the (to me) alarming intelligence that Mr. Brown, of Nottingham, would not be able to continue the office of President; and the duty therefore devolves upon me to deliver the annual address which usually falls from the lips of the President. I am none the less deeply sensible of the very high honour you have conferred upon me in electing me to fill this the highest position to which it is possible for a member of the Association to attain; and I once again most sincerely thank you for your vote. I have not had the honour of membership of this Association for so long a period as most of the Past-Presidents; and I therefore feel that there must be many men among us whose period of service entitles them to this dignity much more than it does a younger member. But I will say this, that I yield the palm to none in an earnest desire after the welfare of our Association and our industry, and that no effort of mine shall be spared to forward the interests of our Association.

Up to the day when I heard of Mr. Brown's retirement, it had been unnecessary for me (as your President) to pay more than passing attention to the events which had been taking place in the gas world; and I must therefore ask you to bear with me in the unavoidable difficulties I have had to face. The time at my disposal for the preparation of an address which I should desire to be worthy of your presidential chair has also handicapped me; and for the same reason I am compelled to abstain from giving you many figures relating to recent personal research into the industry which we all have so keenly at heart.

I should like to say how deeply I feel for Mr. Brown at the present time, and to express the wish that it had not been necessary for him to resign the presidency. We owe a good deal to Mr. Brown, for his untiring efforts after the cheapening of production, and for the most valuable paper, on "Coal Testing," which he read before the Association, October, 1905. His opportunities in this direction are greater than those which fall to the lot of most of us, owing to the magnitude of the works under his control; and I feel that he certainly carried through the tests of which he gave us the results, in a most thorough and able manner.

We have welcomed eight new members to our ranks during the year—Messrs. Allen, Hart, Harrison, Murray, Tomlinson, Smedley, Webb, and Adams; and I think that the only members we have lost by death have been the late Mr. J. S. Reeves, of Bilston, and more recently the late Mr. J. H. Parsons, of Oswestry, and Mr. J. R. Collins, of Stony Stratford. I did not

have the honour of a long acquaintance with Mr. Reeves; but I was always struck with the quiet way in which he seemed to live. I have before me at the moment of writing a copy of the results which were obtained by him during almost the last year of his life, and the figures he was able to produce are striking. Quiet and gentlemanly in his behaviour, conscientious in his work, a faithful servant to his Company, and a true friend, I feel that we have lost one whom it will be most difficult to replace. I am afraid that I was not personally acquainted with Mr. Parsons or Mr. Collins; but I know that they held their appointments at Oswestry and Stony Stratford for several years, and I believe that their work there was useful and that their loss will be deplored by many friends both inside and outside of this Association.

THE JUNIOR ASSOCIATION.

We must congratulate ourselves most heartily on the development and energy of our Junior organization. The privileges which our assistants enjoy to-day are very great; and I trust they will be fully appreciated by those whose advantage it is to enjoy them. I should like to say how highly I have esteemed some of the papers which have been written by the Juniors, and to wish the authors every success in the profession which they have adopted.

PROGRESS OF THE GAS INDUSTRY.

It is exceedingly interesting to note the increase in our business indicated by the latest Board of Trade returns. The return dated Aug. 11, 1896, shows that there was invested by the authorized local authorities and companies at that date £70,819,742. These undertakings supplied 111,443,701,941 cubic feet of gas to 2,659,771 consumers. From the return dated Aug. 9, 1905, the sum invested was £121,241,335, and 155,579,725,000 cubic feet of gas was supplied to 4,737,177 consumers. The return dated Dec. 20, 1906, shows £124,194,221 as invested; 161,407,725,000 cubic feet of gas being sold to 5,064,075 consumers. It will be noted from these figures that, in the decade considered, the capital invested had increased by 75 per cent.; the sales of gas had increased by nearly 45 per cent.; and the number of consumers had increased by over 90 per cent. In the last year reviewed, the increase in capital invested was no less than £2,952,886; the increase in gas sold amounting to 5,828,000,000 cubic feet; and the increase in the number of consumers being 326,891. These figures show vitality and progress in our industry of which we may all well be proud.

CARBONIZING METHODS.

During the year, we have not had any actual results of methods presented of a strikingly different character from those of preceding years; the manufacture and preparation of coal gas and carburetted water gas having been carried on under conditions similar to those which existed at this time last year. We have, however, had the vertical retort brought under our observation at Dessau, Bournemouth, &c.; and some figures have been given as the result of experiments made at Guildford. Experiments are also being carried out at other gas-works on similar lines; and we await the results of these trials, especially those of our Past-President, Mr. Glover, with the greatest interest.

RETORT-HOUSE GOVERNOR.

The retort-house governor has been installed at some works for over twelve months, and, so far as I can gather, has given universal satisfaction. Our experience at Stafford with it has been that we get at least 500 cubic feet more gas per ton of coal carbonized than we were able to get prior to its adoption. Less carbon is deposited in the retorts; the total quantity produced in twelve months—during which time we have carbonized rather more than 17,000 tons of coal—being less than 5 tons. The number of stopped ascension pipes is now only about 3 per cent. of what it was before the introduction of the governor; and, consequently, our plant is kept more fully employed with better results per mouthpiece, and less trouble for the men.

STOKING MACHINERY.

In connection with the paper read by Mr. Allen, of Liverpool, before the Institution last June, I hope we may have results of working of the Fiddes-Aldridge stoking machines as soon as they are fully employed and when figures are available. The fascination of this system is, of course, the simultaneous charging and pushing arrangement, which surely reduces to a minimum the time occupied in drawing and charging retorts. We have now available for us for gas-works of almost all sizes, many excellent types of machines designed for the purpose of dealing with coal and coke in the process of carbonization; and in thinking of this problem, I was much struck by a portion of the address of Sir Alexander Kennedy before the Institution of Civil Engineers. In speaking of engineering problems generally, he said: "The more we see of engineering work, the better we know that none of our problems have one single solution, that all of them can be worked out to the same end in many different ways, and that it is very seldom indeed that, except as to some small detail, any one method is so much better than the others that it has any special claim to be called the right method."

COMPARATIVE COSTS.

In this connection, in looking over the latest statistics published by the "Gas World," I find that there are about eight undertakings in which the wages paid for carbonization amount to less than 2d. per 1000 cubic feet of gas sold. These works are representative of various appliances for the manipulation of coal and coke, and some have no machinery installed at all. We ourselves are in the latter category; and we occupy the third best position in this particular respect. It is not easy to get exactly parallel costs to work on in comparing this particular figure in the costs sheets. Some works include practically everything up to the exhauster; others include stokers and wheelers only; some include repairs to machinery and some do not; and so on. Again, local conditions may be such that the wheelers unload most of the coal and load up most of the coke, which leaves the works in trucks or boats. This is our position. Now the difference in wages paid between ours and the lowest is only 0·24d. per 1000 cubic feet sold; and we have no interest on capital expended on machinery, and no repairs to the machinery to consider. The question all resolves itself into one of £ *s. d.*; and it behoves us, as true men, to select that method of working which we are satisfied is the cheapest for our respective Boards. I have sometimes thought that our enthusiasm has carried us in some cases too far in this question of the introduction of machinery; and I strongly recommend those in charge of gas-works, especially of the smaller works, to consider the question carefully before committing themselves in this way. I purpose referring to the question of giving the workers a financial interest in the welfare of the undertaking; and I am firmly of opinion that this is one of the main factors leading to the solution of this and of many other difficult problems in gas-works management. The costs of purification cannot well be compared town by town. The coals used vary in composition so much, even in one district, that such comparisons are almost valueless.

TABULATED STATISTICS.

I have before me at the time of writing, the statistics for the year 1905-06 tabulated by the "Gas World," and which will doubtless appear in their valuable annual tables. I value this compilation of figures very highly. I study them with increasing interest year by year; and I strongly commend them to the earnest study of every member of this Association. I should like to see one column added, showing the total expenditure less residuals and miscellaneous receipts. But, of course, the resultant figures can easily be taken out by any of us from those published at any time and with very little trouble. In glancing at the particulars so far published this year, and arriving at the above figure, I find that there are quite a number of undertakings whose delivered cost price of working is in the region of 1s. per 1000 cubic feet of gas sold. This is most creditable. For my own part, I have found it exceedingly useful to tabulate our results for many years. Such a course enables one much more readily to touch weak spots, and remedy same, than by the mere comparison of one year with its immediate predecessor. I have followed this course in both the gas and electricity works under me with great interest to myself and no inconsiderable advantage to my Corporation; and I have pleasure in submitting the sheets for the information of any who care to look over them [see pp. 602-3]. The gas statistics run back for 23 years—from the first date when costs statistics were attempted to the present time; while the electric light statistics commence with the first year's working of the undertaking. A glance at the sheets will show how clearly each departmental heading is brought out, and a comparison with the books for any particular year or years will give the reason for any excessive expenditure under any given heading. From this point, any corrective measures may readily be taken if deemed necessary or possible.

RELATIONS BETWEEN CAPITAL AND LABOUR.

In referring back to the year 1900, when my predecessor at Stafford (Mr. Ferguson Bell, of Derby) occupied the presidential chair, I notice that he referred to the cultivation of friendly relations between Capital and Labour, and promised to give you at some future time the results of the Stafford scheme. Unfortunately for its fulfilment, Mr. Bell almost immediately took up the more onerous duties at Derby just after the promise was made. The present affords me an opportunity of redeeming his pledge to you, and at the same time of giving you the results of such a scheme at our works. With some modifications the profit-sharing system as adopted by Mr. Bell is in operation to-day. His scheme was as follows: The bonus payable was calculated by deducting the net profit from the average selling price of gas; the difference in price between this figure and half-a-crown giving the percentage bonus to be paid on the men's wages. The result in actual working was not quite satisfactory, as the value of coal rose abnormally in the two years succeeding, with the consequence that in 1901 the men earned 1 per cent., and in 1902 (when the labour costs were lower than they had been before) nothing at all; whereas in 1900 they divided 4¼ per cent. As a consequence of this, I endeavoured to frame a system which should be entirely dependent on the men's own exertions; and the scheme ultimately adopted was almost identical with one suggested by Mr. Bell at the time the matter was originally under consideration. The scheme, as framed in 1903, and continued since then, reads as follows.

> 1.—That when the total cost of manufacture and distribution of gas shall be less than 10d. per 1000 cubic feet of gas sold, a bonus equal to one-fourth of the difference between that sum and the actual cost shall be divided among the workmen and clerks who have been employed in the Gas Department for not less than three months during the year in which the bonus has been earned.

2.—That in any year where special charges (such as main-laying operations) have been charged against revenue, the amount of such to be deducted from the manufacturing and distribution charges, in addition to the net cost of coal, rates and taxes, depreciation, depreciation on cookers, &c., and that effect be also given to the profit or loss on gas-fittings.

The above deductions are made in order to give effect to the object of the scheme—namely, that it should be based purely on labour results.

The following table shows very clearly our advances made in the direction of the cheapening of production; and I consider the result has been attained to a considerable extent by the pocket interest the men have in the results:—

TABLE *showing Advances Made in Direction of Cheapening Labour.*

	1899 to 1900.	1900 to 1901.	1901 to 1902.	1902 to 1903.	1903 to 1904.	1904 to 1905.	1905 to 1906.
Total cost of gas . .	16·38	19·52	21·80	19·45	18·44	17·028	16·722
Less net cost of coal.	3·68	5·93	8·95	6·11	2·76	1·895	2·243
	12·70	13·59	12·85	13·34	15·68	15·133	14·479
Less depreciation .	1 70	1·68	1 59	1·65	1·62	1·574	1·501
	11·00	11·91	11·26	11·69	14·06	13·559	12·978
Less depreciation on cookers	0·26	0·00	0·40	0·57	0·94	0·811	1·220
	10·74	11·91	10·86	11·12	13·12	12·748	11·758
Less rates and taxes.	1·52	1·47	1·47	1·74	1·66	1·528	1·445
	9·22	10·44	9·39	9·38	11·49	11·220	10·313
Less profit on fittings, &c.	0·00	0·22	0·63	0·78	0·92	0·659	0·562
	9·22	10·22	8·76	8 60	10·57	10·561	9·751
Less extras charged against repairs, &c.	0·00	0·00	0·00	0·00	2·37	2·861	2·126
	9·22	10·22	8·76	8·60	8·20	7·700	7·625
Bonus divided on wages paid . . .	4¼ %	1 %	Nil	3¾ %	5 %	7%	7¾ %
Money paid to men .	£185	£59	Nil	£183	£298	£387	£446

A total sum of over £1558, and an average of 3¾ per cent. on the wages paid over the whole seven years.

I believe my Corporation is the only one that has so far adopted such a scheme; and after a fairly long experience with it, I can confidently assert that relations between the management and the men have never in my experience been more cordial than they are to-day at Stafford. For this reason, and also because we have been able to reduce our labour costs materially, I can commend the consideration of a similar scheme to any Board where the conditions of labour may be more difficult than they are to-day at Stafford.

PREPAYMENT SYSTEM AND COOKER BUSINESS.

The growth of the slot meter system and the development of the cooker business have had my particular attention in Stafford, and the following figures may be interesting:—

TABLE *Showing the Growth of the Slot-Meter System and the Development of the Cooker Business.*

	Cookers on Hire.	Fires on Hire.	Slot Meters Installed.	Total Consumers.	Consumption on Slot Meters.	Average Consumption per Meter.
1900	1037	325	..	3436	11,334,500	..
1901	1633	419	..	3477	13,691,800	..
1902	2282	447	..	2456	18,585,300	..
1903	2781	417	2239	4564	23,002,800	10,273
1904	3170	508	2470	4826	29,754,400	12,048
1905	3491	588	2581	4941	33,610,300	13,022
1906	3713	672	2731	5143	34,186,700	12,518

AN UNTRIED GAS-FIRE SCHEME.

It will be seen that the growth of the prepayment business has been steady; the consumption jumping between 1902 and 1904. We do not just now seem to be getting an equal additional demand for cookers; and this is only natural in a town which has not developed very greatly over a long period of years. A short time ago, I was a good deal exercised in my mind about this business, because I feared that we were approaching finality in development; and I think that this will be confirmed when our figures for 1906-7 are got out. For this reason I looked about for further means of increasing our business; and one of my earliest ideas appeared to be the most fruitful probable source of increased revenue. We are in the fortunate possession of surplus producing plant equal to a manufacture of double our present maximum with a small margin; and with additions to the condensing and purifying plant, an output equal to this amount could easily be dealt with. My idea was to reduce the price of gas to all classes of consumers for heating purposes to the low rate which obtains for power—namely, 2s. per 1000 cubic feet, with discounts up to 25 per cent. according to the consumption. I do not claim any originality in this idea, nor, unfortunately, could my Board see their way (for financial reasons) to adopt my scheme. But the figures are so striking that I cannot refrain from giving them to you, in the hope that they may be of service to our industry.

I proposed to use a secondary meter of the rotary type to be fixed with each fire, the combination to be let out to the consumer at a rental of about 10 per cent. of the cost. At present we have cookers fixed in about 90 per cent. of the houses in Stafford; and I considered that it would be a moderate estimate to assume that three fires would be fixed for every cooker presently installed, or about 12,000 in all; and that they would be used for four months in the year—the fires being credited with four hours burning per diem (one fire thirteen hours, but the others one hour each—fifteen hours), thus discounting the estimate liberally. Now, if we further assume an average consumption of 20 cubic feet per fire per hour, it will be seen that the increased gas consumption per annum would be over 100 million cubic feet with us, which is equal to an increase of fully 50 per cent. Assuming that the average price received per 1000 cubic feet would be 1s. 10d., the gross profit on the system would be £3800 per annum, *plus* (say) £2060 for rentals.

Since we are unable to borrow for fires and the like, we should have to create an overdraft—writing it down on a seven years' life basis in exactly the same way as we treat our cooker purchases at present; the rentals from the fires, &c., being almost sufficient to meet this. An overdraft of £27,000 would have to be created; and the average interest paid on this sum would not exceed 5 per cent., or £1350. There would thus be a surplus of £2500, which would be available for a reduction in the price of lighting gas. This sum would be equivalent to 4d. per 1000 cubic feet to that class of consumer, with the further prospect of a larger reduction as soon as the whole of the overdraft should be paid off, which would probably be in ten years from the commencement of the system. The disadvantages are easily summed up. They are: (1) The increase in capital account This would be of a short date type. (2) The replacement of some of the existing services and meters by others of larger capacity. If such a system should be largely adopted, the advantages would be: (1) All consumers would be able to have cheap gas for heating purposes. (2) All consumers would benefit in a reduced price for lighting purposes. (3) Work would be found for all the available plant in the winter time. (4) Should electricity ever become much more popular for lighting purposes, a substantial business would be built up for gas as a heating agent. (5) Abatement of the smoke nuisance.

THE LIGHTING OF PURIFIER HOUSES.

The recent accident which occurred in one of the purifying houses belonging to the Alliance and Dublin Consumers' Gas Company, calls our attention once more to the question of the lighting of these places. I have for some years lighted our purifying house from two nominal 1000-candle power self-intensifying lamps, placed one on either side of the house at a distance of 15 or 20 yards away from the building. If the house is an open one, I cannot see any better or safer method of dealing with the question. If electricity be employed for the purpose, I am of opinion that the lamps should be permanently and rigidly fixed on the walls or columns. I think this deplorable accident points out the risk of using hanging electric lamps in such positions. Whether the wires be heavily insulated and mechanically protected in addition, or whether they be ordinary flexible wires, there is always likelihood of attrition in such situations, especially if the lamps be swung over the boxes when filling or emptying. Once the insulation is broken down, the risk of fusion is present.

LEGISLATION AFFECTING THE INDUSTRY.

We have very recently had our attention drawn in the columns of the "JOURNAL OF GAS LIGHTING" to recent legislature affecting industry; the Acts alluded to being the Notices of Accidents Act, the Trades Disputes Act, the Workmen's Compensation Act, and the Census of Production Act. In the first named, I consider the principal alteration, so far as we are concerned, is the section relative to factories and workshops, setting forth "That where any accident occurs therein, which . . . (2) is due to any machinery moved by mechanical power, or to molten metal, &c., and so disabling any person employed as to cause him to be absent throughout at least one whole day from his ordinary work, &c., &c." The difference from the present enactment is the necessity to report any accident preventing a man following his ordinary employment for one whole day, instead of three as at present. In the Trades Disputes Act, "peaceful picketing" is legalized. There are several points in the Workmen's Compensation Act which call for comment. So far as we are concerned, perhaps the most important is the definition of the word "workman." The question of "serious and wilful misconduct" only exempts the employer from liability if the workman who is guilty of such conduct happens to survive the accident. If he dies, the employer is liable. Where a principal contracts out part of the work undertaken by him, he is liable for accidents occurring to his sub-contractor's men, with certain protection in specified cases. I think the Census of Production Act explains in its name its object.

TESTING BURNER AND SULPHUR COMPOUNDS.

So far as Gas Provisional Orders are concerned, we cannot fail to be struck by the very usual clauses which are being inserted relative to the testing of gas. I refer to, first, the provision of Harcourt's 10-candle pentane lamp as the standard of light, and the No. 2 "Metropolitan" argand as the standard burner; and, second, the recent applications for the removal of the restrictions relative to the presence of sulphur compounds.

INCANDESCENT MANTLE IMPROVEMENTS.

It is with the highest sense of gratification that we are now assured of a much more stable gas-mantle than that to which we have been accustomed. I note that the illuminating power is stated to be 120 to 130 Hefner candles, which, of course, is equal to 105 to 114 standard candles. But though a good lighting effect is now essential, I look upon it in this case as of secondary importance to the vast improvement in strength which these mantles show, as evidenced by the demonstration of "Cerofirm" mantles,

YEAR ENDING	GAS						RESIDUALS												COST OF MANUFACTURE				
	OUTPUT IN THOUSAND CUBIC FEET	MAKE PER TON OF COAL	GAS SOLD IN THOUSAND CUBIC FEET	GAS SOLD PER TON OF COAL	UNACCOUNTED FOR GAS IN THOUSANDS	PERCENTAGE OF UNACCOUNTED FOR GAS	COKE SOLD PER TON OF COAL CARBONIZED	AVERAGE PRICE	TAR SOLD PER TON OF COAL CARBONIZED	AVERAGE PRICE	SULPHATE OF AMMONIA SOLD PER TON OF COAL CARBONIZED	AVERAGE PRICE	RECEIPTS FROM RESIDUALS PERCENTAGE ON COST OF COAL	COAL &c	COKE	TAR	SULPHATE OF AMMONIA	NET COST OF COAL	PURIFYING	ENGINEER	CARB'G WAGES &c.	REPAIRS &c. OF WORKS	TOTAL MANUF'G CHARGES
														PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.	PENCE PER 1000 CU.FT.
1884	74747	10126	69249	9373	4750	6·4	12	6. 1	-	38 0	-	1 3 10	76·0	12·60	2·61	3·07	3·89	3·03	0·47	1·27	2·44	3·78	7·94
1885	83498	10490	77061	9682	5603	6·7	13	6. 1	-	38 0	-	18 4	70·0	12·46	2·68	2·86	2·87	3·85	0·41	0·66	2·37	2·84	8·28
1886	85608	10179	79134	9410	5485	6·41	13	6 6	-	38 0	-	1 1 2	71·0	12·53	3·27	2·84	2·80	3·62	0·61	0·76	2·50	3·18	7·05
1887	86417	9939	79677	9164	5977	6·91	12·75	6. 9	-	14 9	-	S/A MTS COMMENCED MID YEAR	49·5	12·66	3·67	0·85	1·75	6·39	0·28	0·75	2·51	3·10	6·64
1888	87490	10117	80870	9351	5747	6·57	13.0	5. 9	-	15 6	-	7 4 5	53·35	11·77	3·00	1·12	2·16	5·49	0·35	0·89	2·53	3·09	6·86
1889	90190	9949	83657	9228	5583	6·20	13·0	6 5	-	19 4	-	7 19 5	65·00	11·13	3·44	1 37	2·43	3·89	0·40	0·84	2·35	2·97	6·56
1890	93910	9767	86909	9032	6127	6·52	12·75	9. 0	-	25 3	-	7 19 2	74·30	12·84	5·27	1·90	2·37	3·30	0·57	0·83	2·45	2·77	6·62
1891	102875	9717	94515	8377	7285	7·08	12·75	10 06	-	30 10 4	-	7 5 3	75·00	14·02	6·20	2·29	1·98	3·55	0·83	0·76	2·57	3·00	6·96
1892	112021	8894	104259	8278	6743	6·00	12·50	8 50	-	31 1·7	-	6 19 6	71·00	13·44	5·40	2·44	1·70	3·90	0·93	0·69	2·58	2·67	6·87
1893	121138	9145	110157	8317	9749	8·00	12·50	7 10·5	10·3	24·6	18·1	6 8 6	67·00	12·67	5·15	1·82	1·50	4·20	0·80	0·70	3·04	2·91	7·51
1894	126164	8932	115009	8142	9553	7·59	12·50	8 1	9·6	19 7	17·0	8 9 9	70·30	13·18	5·99	1·39	1·89	3·91	0·59	0·83	2·91	2·96	7·29
1895	138010	9000	127995	8261	8748	6·33	12·50	7 8	10·2	19 0	19·0	9 7 5	65·00	13·2	5·23	1·40	1·85	4·54	0·50	0·75	2·52	2·94	6·71
1896	145055	9345	130102	8382	13697	9·40	12·50	6 9	11·8	20 5	19·0	8 12 7	58·00	11·82	4·16	1·73	0·96	4·97	0·55	0·74	2·76	3·47	7·52
1897	143653	9213	131098	8500	10969	7·60	12·25	6 8	12·0	23 1	20·0	2 17 0	62·20	11·60	4·19	1·98	1·03	4·40	0·62	0·73	2·78	2·99	7·12
1898	148040	9713	133314	8746	13478	9·10	9·35	6 0	11·8	23.6	18·0	4 3 9	56·00	12·11	3·84	1·91	0·97	5·39	0·82	0·72	2·77	3·16	7·27
1899	150114	9861	137130	9009	11188	7·47	9·75	7 0	11·5	22 3	22·0	5 19 5	62·00	12·71	4·45	1·70	1·68	4·88	0·54	0·70	2·85	2·54	6·63
1900	157853	10013	148429	9415	7900	5·00	10·25	9 4	11·2	30 9	20·0	7 10 10	72·00	13·47	5·98	2·21	1·60	3·68	0·52	0·64	2·55	2·95	6·66
1901	165344	9898	152470	9128	10806	6·55	10·00	13 5 5	10·8	32. 9	20·6	6 9 2	68·30	18·71	8·81	2·32	1·65	5·93	1·16	0·63	2·74	3·43	7·96
1902	172248	9387	162185	8838	7909	4 59	9·03	10 4·6	10·2	21 7	17·3	6 19 7	48·20	17·17	5·49	1·49	1·24	8·95	0·55	0·54	2·62	3·11	6·82
1903	174083	9964	164864	9425	7242	4·16	9·01	9 1·1	11·7	24 9	19·8	7 6 10	56·60	14·10	4·79	1·69	1·51	6·11	0·33	0·58	2·32	3·33	6·56
1904	179660	10632	171767	10165	5646	3·14	9·24	10 6·8	11·7	33 7	25·4	8 13 7	78·70	12·95	5·60	2·27	2·32	2·76	0·55	0·61	2·18	3·09	6·43
1905	189730	11692	176800	10895	10375	5·47	9·37	10 7·5	11·5	27 2	27·13	8 17 0	83·60	11·54	5·54	1·70	2·40	1·89	0·19	0·61	1·81	3·56	6·18
1906	191589	11824	185417	11444	3838	2·00	9·22	9 8	12·0	24 10	25·9	8 16 5	78·90	10·62	4·66	1·57	2·14	2·24	0·17	0·58	1·68	3·41	5·86

STATISTICS RELATING TO THE

on the 21st ult. in London; and I regard the further improvement which renders the mantle immune from damage through storage in a damp place, to be a most important one. I consider that, if these claims are substantiated in every-day practice, we have arrived at another stage on the road to perfection in lighting, and that gas lighting will obtain another fillip which may perhaps be only second in importance to Dr. Welsbach's great invention. It is not only in relation to ordinary incandescent lighting that we shall experience benefit, but far more with regard to high-power lighting (where a stable mantle is to such a system as the keystone to an arch) that we shall have in our hands a steady and reliable source of light at a low cost, with an assured maximum of candles per cubic foot of consumption, probably for prolonged periods. One cannot say very much regarding the commercial aspect of this particular mantle, as the price is so far (to me) an unknown quantity; but if the manufacturers can keep the cost down to a reasonable figure—and since the mantle seems to have got a hold on the German market, this appears to be more than likely—we shall have a most invaluable adjunct to the incandescent section of our trade.

I have been endeavouring to obtain some of the Cerofirm mantles since the publication of the above data; and the day before yesterday, through the courtesy of Messrs. Falk, Stadelmann, and Co., I succeeded in procuring three samples from Berlin, one of which I now submit for your examination. In outward appearance, there is little difference between this mantle and those with which we are all so familiar. Owing to certain patent rights, these mantles cannot yet be put on the English market; and I understand that it is not desirable to stock the mantles for longer periods than twelve months. The retail price will work out at about 9d. per mantle. I have tested the mantle—using the Harcourt 10-candle pentane standard lamp as the standard of light and the Bray vertical incandescent burner as the burner under test. The results showed 11·81 candles per cubic foot. There is no doubt the Cerofirm mantle is a very tough one indeed.

COMPETITIVE LIGHTING SYSTEMS.

It is exceedingly interesting to me to trace through the evolution of competitive lighting agents in recent years. I think one may say that the field was held prior to the eighties by candles, oil, and gas; so that the growth of our principal competitor has been phenomenal, notwithstanding the fact that up to quite recent times the lamps used were the old-fashioned arc lamps and the carbon filament lamps. Of course, we well know that Dr. Welsbach's invention gave the gas lighting industry a means of combatting with all its competitors up to a certain point; and the competition, more especially with electricity, would have been much more severe if this invention had not been forthcoming. The light was, and is, much decried in some quarters on account of its colour; but the strange part of the story is the use of the Nernst electric lamp, which is dependant for its light-giving properties on a filament the composition of which is very nearly allied to that of the belittled gas-mantle. The adoption by gas engineers of the inverted incandescent burner is a development on the lines of the ordinary electric lamp.

The efficiency of the Nernst lamp, 1 ampere size, may be taken at about 2 watts per candle power; the smaller sizes not being so efficient. Of metallic filament lamps, the type which we have preferred at Stafford is the "Tantalum," made by Messrs. Siemens. We have tried the "Osmium" lamp; but the great drawback to the examples we experimented with was their exceeding fragility. They were unsuccessful off the vertical, and would not stand any but very careful handling. The trial was made about a year ago; and it is possible that early difficulties may have been got over to some extent. Of the Tantalum lamp, I consider it to be the best electric lamp suitable for domestic work which has yet been brought out. It is made for use on various circuits up to 130 volts pressure, and for higher voltages two or more must be used in series—adaptors being made to fit ordinary lamp sockets. The efficiency of this lamp when new may be taken at about 1·8 watts per candle power, or more than double that of the old carbon filament lamps at 4 watts per candle power. The candle power is rated from 11 with the 50-volt lamp to 27 with the 130-volt lamp; and the makers claim a life of from 500 to 800 hours. This may represent an average life; but we have had them fail at a very short period, and also running on for over 3000 hours without failure. The "Sun" Tantalum lamp is made on the same principle as the standard type, but is for higher candle powers. It is supplied usually with a "Holophane" glass reflector; and is rated from 27-candle power for the 65-volt lamp to 53-candle

COST OF DISTRIBUTION				MANAGEMENT CHARGES						MISCELLANEOUS CHARGES														
SALARIES	REPAIRS TO MAINS & SERVICES	REPAIRS TO METERS	TOTAL DISTRIBUTION COSTS	SALARIES OF COLLECTORS	AUDITORS	STATIONARY AND PRINTING	GENERAL ESTABLISHMENT CHARGES	TOTAL MANAGEMENT CHARGES	RATES AND TAXES	LAW COSTS	BAD DEBTS	MISCELLANEOUS	TOTAL MISCELLANEOUS CHARGES	SALE OF GAS LESS SERVICE TO PUBLIC LAMPS	COAL AND WORKING EXPENSES LESS RESIDUALS	TOTAL MISCELLANEOUS RECEIPTS	COAL AND WORKING EXPENSES LESS RESIDUALS AND MISCELLANEOUS RECEIPTS	GROSS PROFIT	INCOME TAX	INTEREST ON CAPITAL	LOANS REPAID ACCOUNT	DEPRECIATION FUND	DEPRECIATION ON STOVES	BAD DEBTS RESERVE FUND	NET PROFIT
PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.	PENCE PER 1000 CU. FT.
0·57	0·39	0·75	1·71	0·34	0·06	0·14	0·20	0·97	2·33	-	0·50	-	0·50	40·66	16·48	0·61	15·87	24·79	0·45	11·85	-	2·72	-	-	4·13
0·48	0·24	0·81	1·54	0·31	0·05	0·17	0·20	0·73	2·03	0·03	0·22	0·05	0·30	38·98	14·85	0·84	14·21	24·89	0·49	10·30	-	2·67	-	-	6·09
0·54	0·21	0·71	1·46	0·30	0·05	0·17	0·19	0·71	1·95	-	0·15	0·17	0·32	38·77	15·11	0·49	14·62	22·31	0·72	9·80	-	2·60	-	-	5·31
0·54	0·23	0·69	1·46	0·30	0·05	0·14	0·21	0·70	1·85	0·01	0·16	-	0·17	36·25	18·21	0·88	17·33	19·72	0·65	9·53	-	2·58	-	-	3·11
0·56	0·22	0·78	1·54	0·32	0·05	0·15	0·19	0·71	1·77	-	0·15	-	0·15	36·29	16·52	0·34	16·18	20·11	0·49	9·24	-	2·54	-	-	3·87
0·55	0·14	0·71	1·40	0·32	0·05	0·11	0·18	0·66	2·14	-	0·19	0·02	0·21	35·96	14·86	0·34	14·52	21·44	0·43	8·78	-	2·46	-	-	4·35
0·55	0·14	0·74	1·43	0·30	0·05	0·16	0·26	0·77	1·92	-	0·77	0·04	0·81	35·38	14·37	0·24	14·13	21·30	0·52	8·17	-	2·37	-	-	6·16
0·54	0·19	0·85	1·38	0·28	0·04	0·18	0·22	0·72	1·79	-	0·12	0·02	0·14	34·10	14·61	0·06	14·55	19·82	0·44	7·32	-	2·18	-	-	5·77
0·52	0·40	0·85	1·77	0·27	0·04	0·18	0·27	0·76	1·53	-	0·23	0·01	0·24	33·48	15·14	0·17	14·97	18·56	0·40	6·78	-	1·97	-	-	5·74
0·50	0·36	0·64	1·50	0·26	0·04	0·17	0·27	0·74	1·46	-	0·25	0·04	0·27	31·90	15·80	0·24	15·56	16·48	0·39	6·80	-	2·05	-	-	2·71
0·48	0·35	0·69	1·52	0·25	0·05	0·11	0·22	0·63	1·63	-	0·30	-	0·30	31·66	15·38	0·25	15·13	16·63	0·40	8·53	4·84	2·13	-	-	2·63
0·38	0·22	0·54	1·14	0·23	0·05	0·11	0·20	0·59	1·41	0·01	0·24	-	0·25	31·11	14·75	0·23	14·52	16·64	0·43	5·67	4·46	1·94	-	-	4·09
0·43	0·29	0·59	1·31	0·23	0·05	0·09	0·36	0·73	1·47	-	0·17	-	0·17	31·05	13·37	0·25	13·12	15·07	0·48	5·40	4·56	1·91	-	-	2·58
0·26	0·43	0·54	1·23	0·24	0·04	0·12	0·20	0·60	1·53	-	0·15	-	0·15	31·14	15·09	0·13	14·96	16·18	0·43	5·19	4·70	1·90	-	-	3·96
0·26	0·37	0·47	1·10	0·25	0·05	0·15	0·21	0·66	1·58	-	0·23	0·02	0·25	31·17	13·29	0·11	13·18	14·99	0·47	4·88	4·81	1·87	-	-	2·89
0·25	0·24	0·57	1·06	0·27	0·04	0·14	0·18	0·63	1·58	0·08	0·19	0·03	0·28	31·53	15·25	0·43	14·82	16·85	0·43	4·56	4·86	1·83	-	-	3·00
0·36	0·46	0·45	1·27	0·46	0·05	0·17	0·21	0·89	1·52	0·01	1·70	-	1·71	31·50	14·68	-	14·68	17·08	0·46	4·27	4·67	1·70	-	-	3·72
0·36	0·33	0·61	1·30	0·44	0·05	0·22	0·19	0·90	1·47	-	0·22	-	0·22	31·51	17·84	0·22	17·62	13·89	0·74	3·93	4·96	1·68	-	-	2·58
0·35	0·40	0·72	1·47	0·37	0·05	0·16	0·25	0·83	1·47	-	0·18	0·03	0·21	31·69	20·21	0·63	19·58	12·51	0·71	4·09	4·88	1·59	-	-	0·84
0·38	0·46	0·93	1·75	0·31	0·05	0·16	0·22	0·74	1·74	-	0·21	0·07	0·28	31·73	17·80	0·78	17·02	15·28	0·67	4·68	4·96	1·65	0·57	-	2·75
0·36	2·75	0·74	3·85	0·31	0·05	0·16	0·21	0·73	1·63	0·25	0·16	0·03	0·44	31·92	15·88	1·05	15·83	17·09	0·55	4·44	5·38	1·62	1·07	0·14	3·89
0·36	2·08	1·42	3·86	0·33	0·04	0·13	0·21	0·72	1·52	0·23	0·11	0·04	0·38	32·03	14·64	0·95	13·69	18·33	0·68	3·89	5·43	1·57	1·10	0·13	5·52
0·35	2·28	1·17	3·81	0·33	0·04	0·13	0·23	0·74	1·44	-	0·05	0·01	0·06	30·97	14·21	0·77	13·44	17·53	0·65	3·57	5·38	1·50	1·22	-	5·20

STAFFORD CORPORATION GAS UNDERTAKING.

power for the 130-volt lamp. The metal tantalum from which the filaments of these lamps is made, is, in its pure state, a very hard and ductile metal. For the purposes of these lamps it is drawn down to a thickness of from 0·035 to 0·05 mm. The length of the filaments is about 25½ inches; and they are used *in vacuo* in a bulb similar to the ordinary carbon filament glow lamp.

Experiments are being made at the present time by many investigators with metallic filament lamps composed of many of the very rare metals and alloys of such, among which may be mentioned iridium, tungsten, osmium, molybdenum, and zirconium; and some inventors claim to have obtained as high an efficiency as 1 watt per candle power. The metallic filament lamps promise a much more regular life than seems possible with the carbon filament lamp. With the latter, in a life of 800 hours on our circuit of 210 volts, it is not an uncommon thing to find that a nominal 16-candle power lamp has dropped to 11-candle power at the end of its life; and while at the commencement its efficiency has been in the region of 4 watts per candle, or perhaps a little better than that, with this drop in lighting value there is naturally a much poorer efficiency, although, of course, it does not necessarily follow that the total consumption per lamp has increased. I do not think the drop in efficiency is much more than 10 per cent. in the case of metallic filament lamps throughout their life.

With regard to modern forms of flame arc lamps, I am sorry to say my experience in actual working has been *nil;* the only reason being that we have had no suitable places requiring lighting of this description. I have no doubt all of you are quite familiar with the lamps. There is still, I believe, some trouble with flickering, and a little also with deposits caused by the gases which are evolved. The lamps are highly efficient, and are, in my opinion, the most powerful individual lights of any at present available.

I do not think it is at all necessary for me to apologize to you for taking up your time with data respecting our most serious competitors as gas engineers. Indeed, I consider that the man who has this information at his finger ends is the one best equipped for the struggle for supremacy; and it is for this reason that I have ventured to offer these figures relative to the efficiencies of various electric lamps.

MOTIVE POWER COMPETITION.

The question of competition for the supply of motive power is one which, although not vital, is likely at a rough guess to affect perhaps 15 per cent. of our total output. We hear of various municipalities and some companies who are offering electricity for sale for power purposes at prices ranging from ½d. to 1d. per unit in large quantities; and several people have asked me how this can be done profitably. I fancy that the restrictions imposed as to the quantity of current to be supplied before these low prices obtain will debar most ordinary consumers from availing themselves of the scale. But prices of 1¼d. to 2d. per unit are fairly numerous; and I am convinced that business at these figures is not only possible but is commercially sound. We ourselves supply a large quantity of current for power purposes—practically half our output—at 1¼d. per unit. The principle which I have recognized in this connection is, of course, the running of machinery at periods when it would otherwise be idle; and to do this very little additional labour is necessary up to a certain point. At the same time, due consideration must be given to increased wear and tear; and depreciation of machinery must not be lost sight of.

I think that a parallel case can be made out for the regulation of a price for gas supplies for power purposes; and I am of the opinion—which I know is not shared by many high authorities—that in these days of competition with electricity, suction gas, and steam for power supplies, such modifications in price should be made. Although it may be argued that only the large consumers benefit by the reduced rates, I hold that practically the whole community benefits, as where such systems hold good, manufacturers are enabled thereby to compete with others on more advantageous terms, with the natural sequence that the workers obtain more steady employment. To obtain a basis to work on, I consider that the total delivered cost of the gas supplied should be arrived at, less residuals and miscellaneous receipts, and that whatever price is charged in excess of this figure will contribute to the dividends of companies or to interest and sinking fund in the case of municipalities. If it were possible to idealize in this respect (unfortunately it is not), we should have an equalized load for our works throughout most of the

twenty-four hours. If you will turn for a moment to the figures I have already given regarding—shall we say—a chimerical gas-fire scheme, the effect to the lighting consumer is clearly shown; and if this could be realized, whether the supply be for power or for heat, I am certain that, in well-ordered supplies, in a comparatively short time the price of lighting gas would be materially reduced, and would approximate that charged under the scale mentioned for power and heating purposes.

TRAIN LIGHTING BY GAS.

A good deal has been said lately about the dangers of lighting railway trains by gas, and specially the attendant fire risk in case of accidents. The advocates of other forms of railway carriage lighting have done their utmost to impress these risks on those in authority; but when the question is thoroughly boiled down, there appears to me to be nothing at all in it. The percentage of railway accidents to train journeys is, thank goodness, infinitesimal in this country; and I do not think that the fear of such accidents would deter one man in a thousand from taking the risk of a railway journey. We have it on the authority of the Board of Trade records of all the accidents which have been reported on by them for the past twenty-six years (numbering 1478), that in only four cases had the wreckage been fired by gas—a percentage of 0·27 of the total accidents. The cost of lighting trains by gas is the cheapest available; and the lighting by means of incandescent burners is superior to any other form I know of, and the risk is *nil*.

THE TRAINING OF ENGINEERS.

Educational matters have been so frequently treated by the Presidents of this and kindred Associations, that I do not propose to say very much on the subject. My own father was most generous in this respect to me; and his method was a very good one. After leaving school, where he provided me with an excellent education, I spent two years in his works; and thereafter served a pupilage under my old friend and master Mr. T. O. Paterson, of Birkenhead. During the period of my articles, I spent a year at Victoria University studying chemistry, electricity, and civil engineering generally, in addition to the usual courses of night study during the whole time. My only regret is that during the period of my education, especially in the earlier part of it, I had not sufficient knowledge of the importance of assimilating everything which was put in my way; and I fear that so long as boys are boys and young men are young men, so long will this state continue. But I do beg those young men in our own profession whose parents are making sacrifices to give them adequate equipment for the strenuous work of their lives, and who may read these words, to profit by the experience of an older man, and leave nothing to chance. Take and make every opportunity of gaining useful knowledge, or in this connection, to quote a homely Scottish proverb, "Tak a' ye can get and aye keep gapin' for mair."

Gentlemen, I feel that I have left unsaid a good deal which I might have said. Our profession is such a wide one, embracing such a variety of attainments, that it is difficult to individualize. It has always been my hobby; and I am now more enamoured of it than ever before. We have in our hands a highly technical and scientific work which in real interest can only be rivalled by very few. May we realize this, and may our industry continue in the van of progress, as a study of our national statistics proves that she has done in the past.

At the close of the address,

Mr. R. O. Paterson (Cheltenham) said he had been asked to propose a vote of thanks to their worthy President for the most interesting and instructive address he had delivered to the members. In the closing paragraph of the address, the President said he felt he had left unsaid a good deal that he might have said. He (Mr. Paterson) believed they were all of one mind, that Mr. Pooley had said a great deal indeed in the time he had been addressing them. A considerable amount of most useful and valuable information had been laid before them; and there was visible the mind of a master in the gas industry's work in every paragraph of the address. He (Mr. Paterson) thought it was really a matter over which he and some of those around him could not help feeling an amount of wonderment, that year after year at these Association meetings there came up Presidents who could treat a subject about which they thought they all knew everything in a way in which it had never occurred to them to treat it themselves. There seemed to be no possibility of arriving at a point when a new President would not have something entirely fresh to say. He (Mr. Paterson) could not help feeling he must be getting an old man, because here they had an excellent President, though only young, whom he could remember as a boy at his brother's works, who was now the President of the Association, and whose address he for one had listened to with rapt interest. He thought there was only one mind in the whole body of the meeting, that they were gratified indeed in having listened to the address. The members felt the President had been put to a strain that it was never intended should have been put upon him, and that he had risen to the occasion with an admirable amount of energy; also that he had revealed an ability for the work which none of the members really had looked to him for. He thought this was neither more nor less than he ought to say. The feeling was that the President had more than astonished them.

Mr. E. Allen (Liverpool) seconded the motion. He said the thanks of the members were indeed due to the President for the exceedingly able manner in which he had fulfilled this first duty of his office. It was a very proper rule that they should not admit criticism of a presidential address; but there was no room for criticism in this address. What had to be done therefore was to put a large note of admiration at the close of the address, as representative of the feelings of the members. The wise words with which the address had closed made one wish that these were added to the Book of Proverbs. He had no doubt whatever that the larger audience that would read those words would profit by them. Those among them who were getting older knew that they had not made the best of their early opportunities. But he did think, in their particular profession, there was more interest taken in their work than in the case of many other professions. He noticed at every meeting he attended, in every paper written, the keenness with which gas engineers attacked the problems appertaining to their business. He thought they could congratulate Stafford on having a good engineer who had followed a good engineer, and both of whom had attacked problems connected with the gas industry with great success.

The motion was carried by acclamation.

The President, in responding, said he was grateful for the kind words that had been said about him and his address. He confessed that he was very much taken aback early in January when he found he had this task before him. He, however, thought it was the duty of every man elected to the office of Vice-President to be ready to fill a gap if unfortunately it should be necessary; and he certainly was not going to shirk that duty.

Mr. S. O. Stephenson (Tipton) then read a paper, entitled

AUTOMATIC STREET LIGHTING.

The subject of public lighting is recognized as of very great importance to the gas industry, and deservedly so. It is our best (or worst, as the case may be) advertisement. The public judge us largely by our street lighting. If this is up-to-date, brilliant and well kept, then our gas is good; and if a consumer has cause for complaint in his own house, he is apt, looking at the good illumination of the street-lamps, to feel that it might be as well to investigate his fittings. On the other hand, if the street lighting is poor, antiquated, and ill-kept, be our candle power never so high, our gas is bad; and all possible complaints are attributed to this—the final clinching argument often being: "Look at the light in the streets." In those towns where electricity has captured the street lighting, the advertisement is theirs; and in consequence of it, I believe they often gain consumers they would not otherwise get. So that it behoves us to zealously guard, hold, and give our best attention to it—to make it as good an advertisement as possible, and profit therefrom a minor consideration. It is a popular notion that electricity is superior to gas for street lighting because "all the lamps can be lighted or put out at once." Now, there are few places I believe where this is done; nor am I able to name one. They are often lighted, a whole street or half-a-dozen at a time; but I know of several towns where each lamp is switched on separately, lamplighters going round exactly as for gas-lamps, except that they have a hooked stick or key instead of a torch. For electric people to light a whole town at once, they require a separate cable for the lamps; and I am not aware that this would be much simpler or less costly for them than for us to lay a separate gas-main.

One ever-fruitful source of complaint with street lighting lies in the time which it takes to get all the lamps lighted and extinguished. If we employ many lamplighters the work is done fairly quickly, but the expense in wages is high; while if we cut these down the work takes longer to do, and there is more waste of gas, to say nothing of grumbling. We generally endeavour to strike a medium between the two and get the most economical working. In any case we are unable to avoid the grumbling which results from an imperfect system. We are compelled to start lighting the lamps before artificial light is necessary; and the usual state of affairs is that half the lamps are alight before they are needed, and the other half are not alight by the time it is dark. We are then placed between a cross-fire of criticism. Mr. Jones, who happens to live where the lamplighter starts, growls about the abominable waste of rates by having the lamps alight in broad daylight; while Mr. Brown, at the other end of the round, lets the world know that he is paying rates and not receiving value for same—the part of the parish where he resides being neglected and left unlighted a portion of the evening. Should you reverse the round, they do not give signs of satisfaction for very long, and each adopts the former argument of the other. In an industrial neighbourhood this is still further complicated by the labour element, who insist that not a lamp should be touched until day has dawned, which means in mid-winter having lamps alight up to nine o'clock in the morning before all can be extinguished. As they have no desire that gas should be wasted, they propose to compensate for this by putting back the lighting of the lamps an hour in the evening, as "the shops light up the streets." This soon brings the shopkeeper to the fore with the demand to know why he should have to pay rates and light the streets for a part of the evening in order that the lamps should be alight quite unnecessarily (in his view) in the morning. A successful automatic lamplighter is the magic wand which will banish all these troubles at a touch; and not only so, but place gas lighting in a position of far greater advantage than electricity, as no special mains are required.

The idea of automatic street lighting is by no means new. I remember as far back as the year 1890 being shown by the late Mr. T. S. Borrodaile an arrangement he had invented. It was somewhat complicated, and worked by variation of pressure in the mains, but differed from most of the present pressure worked lighters in that the pressure was continuous instead of momentary in action. The idea was that when the maximum night pressure was put on, a valve opened and the gas passed to the burner, being ignited by a pilot jet; the valve remaining open so long as the pressure kept up. When the lower pressure of day was on, the valve closed. This, I believe, worked very well in the laboratory, but failed in the more arduous trial in the streets. A number of the lighters were tried in a portion of the South Metropolitan Gas Company's district, but, unfortunately, proved unreliable—sometimes lighting up in the daytime and refusing to do so at night, as well as coming in and going out unexpectedly at odd times. Much advance has been made on this; and automatic lighting is now fairly well established and working satisfactorily in many instances.

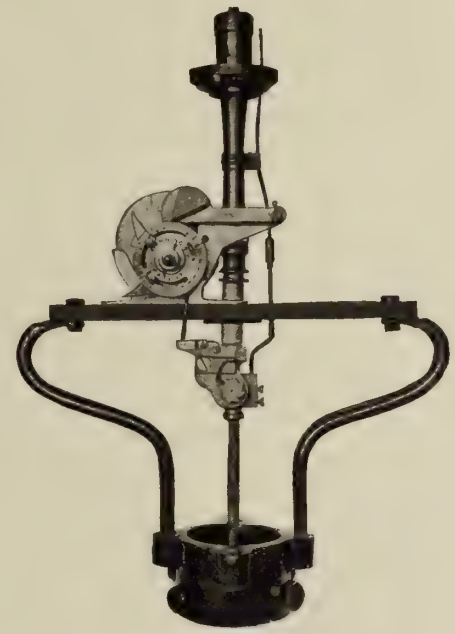
Automatic street lighting apparatus may be divided into three classes—those working by clockwork, by pressure applied through the mains, and by electric current. The last may be ruled-out, as being impracticable at present. Of the other two, there are several satisfactory examples, each good of its kind. Both systems have one thing in common—they necessitate the use of a pilot jet, which happens to be the part most liable to go wrong.

The first successful automatic street lighting apparatus was, I believe, that of the Actien Gesellschaft fur Automatische zund und Loschapparate, of Zurich, a Swiss patent, which was introduced at the Engineering Congress at Glasgow in 1901 by M. Rothenbach, of Berne. Clockwork is the operating medium; and it has to be set to the required times of lighting and extinguishing and wound each week. It requires a special lantern frog, to which it is affixed, and thus adds to the expense. The clockwork acts directly on the gas-cock; the lighting and extinguishing being gradual. It is made to light and extinguish once each in the twenty-four hours, or to extinguish at a given time and then relight for a short period before dawn. It is also made, in the case of cluster lamps, to extinguish one or two burners of same at a different period to the others. Finally, by means of a bye-pass arrangement, it is also made so that it can be controlled by a cock independently of the apparatus. It has not, however, been taken up to any extent in this country, nor, I think, likely to be.

Shortly after this, Gunning's patent was put upon the market, and is the apparatus most widely in use in the United Kingdom at present. It is worked by clockwork, does not necessitate a special frog, and is usually fixed inside the lantern. Its principle is, I think, well known to most—see figs. 1, 2, 3. On a revolving



Automatically lights all burners at dusk; extinguishes majority at (or about) midnight; rest at dawn.



For self-intensifying burners where height in lantern is limited.



For quickly lighting high-pressure and self-intensifying burners.

Figs. 1, 2, 3.—Gunning's Automatic Controllers for Public Lamps.

disc marked with the hours, 24 divisions (12 hours day and 12 hours night), two or more movable pointers are fixed. These are set one to the hour of lighting the other to the hour of extinguishing. As the disc revolves with the working of the clock, the first pointer catches in the toothed wheel attached to the cock and forces it round, opening the gas-way to the burner, where the gas is ignited by the pilot-jet. The other pointer, coming round in due course, also catches in the toothed wheel, forces the cock round once more, closes the gas way, and thus extinguishes the lamp. This is the simple form. They are also made to light at dusk, extinguish at 12 o'clock midnight, or other selected time, and then light up for an hour to light the roads for men going to work—being finally extinguished at dawn. Like the Swiss apparatus, they have to be wound up once a week, and the pointers on the disc at the same time set to the required hours of lighting and extinguishing for the week. This tends to ensure each lamp getting cleaned once a week, as the man has to go to it. Both these appliances have, to my mind, one drawback. The opening or closing of the cock is not instantaneous, but gradual—taking something like 10 minutes to entirely open or close it. With incandescent, and more particularly with inverted burners, this must render lighting-back of the burner very liable. There is also the possibility of the attendant setting the pointers wrong, though I see no reason why any man with ordinary intelligence should do so.

The most perfect form of automatic street lighting apparatus operated by clockwork which I have seen is the Horstmann gas-controller. It is a most ingenious and yet fairly simple machine, and greatly reduces the personal element. The turning on or off of the cock and lighting or extinguishing of the lamps is immediate, not gradual. A further advantage, and one which makes such a wonderful and unique feature of this apparatus, is that it does not require setting for the time of lighting each week by an attendant, who may make a mistake. The setting is done day by day by the apparatus itself automatically altering the time of lighting and extinguishing according to the length of each day. The only attention required is the winding of the clock every week when the lamps are cleaned, or at slightly longer periods if desired. This automatic timing can be arranged to suit any requirement or any part of the world. All that is necessary is to make out a chart with the variation of times of lighting and extinguishing which may be required for each day or week over the year, and the apparatus will be made to work to this chart. As with the others, it can also be made to put the lamps out at midnight and relight them for an hour or so before dawn. A further advantage is that the cock can be operated by hand, without interfering with the mechanism, at any time this may be desirable, as in case of thick fog. It is fitted inside the lantern, and does not necessitate a special frog.

On removing the two covers of this controller, it will be seen (fig. 4) that on one side is an ordinary clock, together with a disc and lever for opening and closing the burner cock. On the other side is the principal mechanism of the controller. The working of the apparatus is as follows: The dial plate A, which is shown divided into two periods of twelve hours each (night and day), rotates, together with the discs and other parts which may be seen upon it, in the direction of the arrow and in unison with the clock upon the other side—making a complete cycle in the twenty-four hours. During its passage, the star-wheel B comes in contact with the pin C, which is fixed to the case and immovable, receiving a quarter turn. The star-wheel is attached to the spindle D, which is provided with a worm E at the centre and a square shank at the other end, against which a spring presses, ensuring that no more than a quarter-turn will be given. The spindle D, therefore, receives a quarter-turn once in the twenty-four hours; and the function of the worm E, which is geared into the wheels F and G, is to transmit this motion to them, causing each to make a complete cycle exactly in the year.

Attached to, and beneath, these wheels are two cams H and I, which move round with the wheels. Against the edges of these

cams rest two pins K and L, one against each cam; each pin being fixed into discs, one below the other, and pivoted centrally with the dial plate A. The situation of these discs is below the dial plate, the pins working through circular slots cut in the plate. Each of these discs carries on an extended arm another pin at the circumference of the dial plate; and these pins K′ and L′, travelling round with the working of the clock, force back the lever M, setting the operating mechanism in motion, which causes the disc A to make half-a-revolution. On this disc is fixed a pin F, which catches against the shelf D or C attached to the lever E, thereby forcing the lever down or up in its travel, and thus opening or closing the cock on the burner accordingly. The particular operation depends, of course, upon whether the travel of the pin be downward or upward. The disc A in one complete revolution will have performed the two operations of lighting and extinguishing. In the first half-revolution, the pin F, pressing on the shelf D, forces the lever E down, and opens the cock; the gas in the lamp being lighted by the pilot jet. In the subsequent half-revolution of the disc, completing the cycle, the

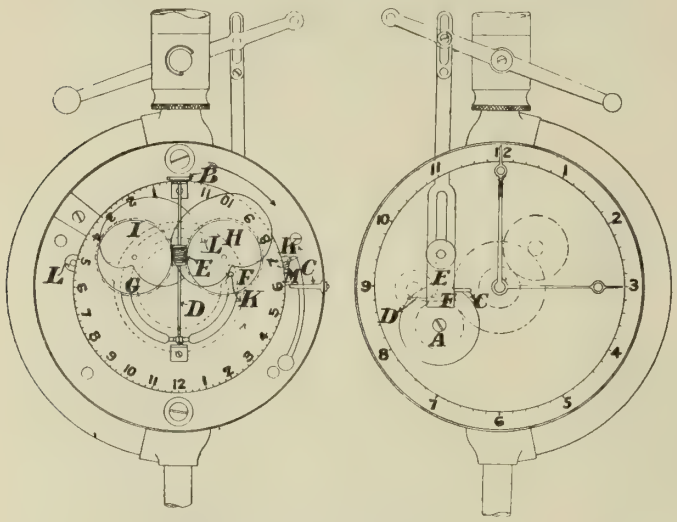


Fig. 4 —Horstmann's Controller.

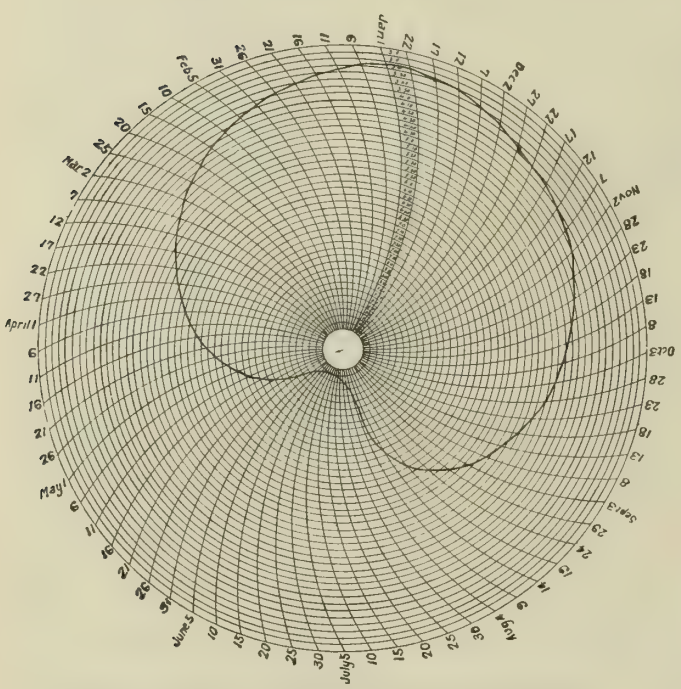


Fig. 5.—Chart for Working the Horstmann Controller.

pin pressing against the underside of the shelf C forces the lever E up, closing the cock, and extinguishing the light. The pins K′ and L′ therefore, by acting upon the lever M, effect the lighting and extinguishing respectively, and correspond with the fingers or pointers on other clockwork apparatus which have to be set weekly, but which, in this controller, are automatically varied daily. It will be seen that the pins K′ and L′ are coincident with the pins K and L attached to the same discs, each to each, and which pins K and L rest against the cams H and I respectively. It is these cams which form the governing factor of this controller, for their position is varied daily by the action of the worm E on the wheels F and G to which they are attached; and it is obvious that the cams are consequently continually presenting fresh radii against which the pins K and L rest, and therefore daily altering the circumferential positions of the pins K′ and L′ around the dial plate, the divisions on which correspond to the hours of the day and night. In this way, the controller automatically varies the times of lighting and extinguishing, day by day, the year round.

To have the controllers made to work to the particular schedule of lighting and extinguishing hours required, a chart is taken (fig. 5), of which the radial lines represent the weekly or other equal divisions of the year, and the circular lines the range of hours of the day on which lighting will be required to occur throughout the year. On this chart the bisection of each radial or period line with the circular line which represents the time of lighting required for that particular period is marked. Each radial line having been marked off in this way, the marks are connected with a complete line, giving the form of a cam, which, when made to the proper size and fitted in the controller, will light the lamps according to your schedule. A similar chart, with the exception that the circular lines give the times during which extinguishing will be required to occur during the year, is marked off in the same way to obtain the template for the cam to vary the time of extinguishing to your schedule.

To allow of the lamp being lighted or extinguished by hand independently of the mechanism, the movement of the disc A is so arranged that, in making its half-revolution, it always stops in such a position that the pin F is as near the top or bottom as possible, but just clear of the shelf C or D as the case may be. Thus, if the cock be shut, the pin F is able to just clear the shelf C, which will not therefore foul it if the cock be opened by hand; and if left open, the disc A, in making its half-revolution, in due course will bring the pin F into position under the shelf C, ready for lifting it, but just clear of the shelf D, so that the cock can likewise be closed by hand, as the shelf D, being clear of the pin F, will not foul it in rising. As in the former instance, if left like this, the subsequent working of the mechanism will bring the pin F into position on the shelf D ready for forcing it downwards at the next time of working; so that the turning of the cock by hand in no way affects the mechanism, not even the automatic daily variation.

Another clockwork apparatus was introduced by Messrs. Falk, Stadelmann, and Company. It is, however, rather big, expensive, and, like the Swiss patent, requires a special frog to which it is fixed. Curiously enough, it seems to have been principally adopted by the large shopkeepers in London to operate the switches governing the electric lighting of their windows, so enabling them to display their wares for any desired period after closing, without necessitating the personal attention of somebody to cut off the light when the display has lasted as long as they consider useful or desirable.

The particular apparatus which we have adopted at Tipton is the patent of Mr. John Anderson, of Edinburgh (fig. 6), and more usually associated with the firm of Messrs. Alder and Mackay. It is one of the pressure type; being worked by a momentary increase of pressure in the mains beyond the maximum working pressure, and has the charm, which appeals so strongly to the British engineer, of simplicity. It is small, compact, and, when fixed inside the lantern, is almost unnoticeable. It is in the form of a small governor, the bell A working in a narrow lute sealed in mercury. The gas has a free-way into the apparatus; the disc valve B controlling the supply being on the outlet pipe leading to the burner. The outlet pipe is carried up from the bottom of the apparatus and turned at right angles towards the centre; the valve thus being vertical. The rotating disc is in the form of a ratchet wheel, and the holes or slots in it are cut on the same

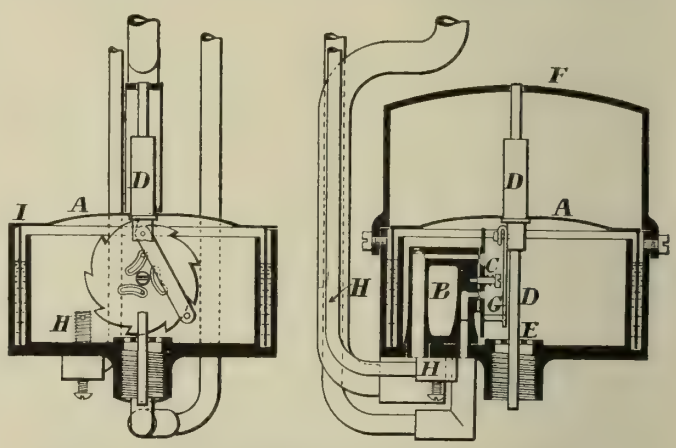


Fig. 6.—Alder and Mackay's Street-Lighting Apparatus.

radius as the gas-way in the valve. The surfaces of the disc and valve, where they come in contact, are faced true, and the disc is fastened to the valve by a pin C, on which it is free to turn; the disc being kept in constant contact with the valve and perfectly gas-tight by a small spring. For cluster lamps, where it is desired to extinguish all but one burner after a certain hour (the remaining burner to be extinguished later), the valve is provided with a second gas-way on a different radius to the first, and with a second outlet pipe. Three curved slots are cut in the disc in such a way that the first movement of the disc uncovers both gas-ways in the valve by one slot; the second movement covers the outer gas-way, but leaves the inner one leading to the single burner, uncovered; and the third movement covers both gas-ways.

There are four types of this apparatus; the first being a simple one to serve where the desire is simply to light all lamps at dusk

and extinguish all at dawn. In this, the movement of the disc uncovers and covers the gas-way in the valve alternately. The other three types form one class, and are arranged for partial extinction at midnight or other selected time—the remainder to be extinguished at a later hour. This class necessitates three operations in the twenty-four hours. Of these three types, one is arranged to extinguish at the second operation—at midnight, for instance; another to remain alight until the third operation, or dawn; and the fourth type is for cluster lamps, as previouly described. For the type to extinguish at midnight, the first movement of the disc uncovers the gas-way; the second covers it; and the third still keeps it covered. In the type to extinguish at dawn, the disc has three slots. The first movement uncovers the gas-way by one end of the slot; the next brings the other end of the slot over the gas-way, so that it is still uncovered; and the succeeding movement covers the gas-way by the blank between the slots.

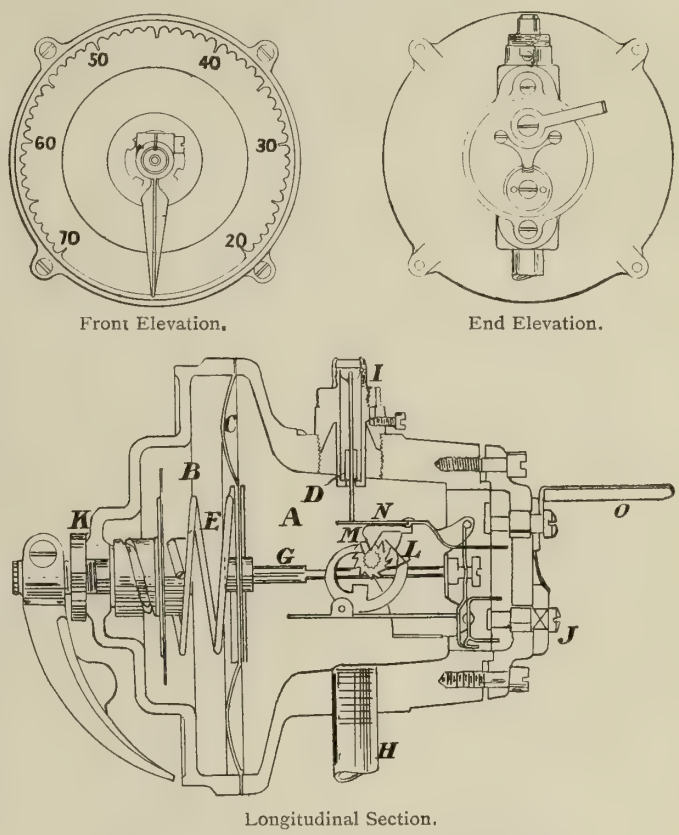
It is the second class, for partial extinction at midnight, which we have adopted at Tipton. The mechanism for operating the valve is simple. A guide-rod D passes right through the bell, working at the bottom in a guide E cast in the base of the governor, over the gas inlet, and at the top through the centre of the guide F, which is fastened to the two sides of the governor. The guide-rod has a greater diameter below the guide F than the part which works through it; thus forming a stop to prevent the bell rising too far. Attached to the guide-rod at the roof of the bell by a pin on which it swings freely, is a pendulum G, having at its lower extremity a pin fixed at right angles. This pendulum is so arranged that the pin will catch on the teeth of the ratchet-wheel or disc of the valve, causing it to move round on its axis each time the bell is raised. The full rise of the bell corresponds to the distance between each tooth of the ratchet-wheel; and as there are nine teeth, it therefore moves one-ninth of a turn, or through an angle of 40°, with each rise of the bell. This refers to the Class 2 series. In Class 1 series—to light and extinguish alternately—the number of holes in the disc is four, and the number of teeth eight; the ratchet-wheel thus moving through an angle of 45° each time. A valve of this type can be adapted to many other different combinations and arrangements of lighting by varying the number and position of the outlets, teeth, and holes. In addition to the outlet pipe, a bye-pass H is fitted into the base of the governor and conveyed to the pilot-jet at the burner.

For the purpose of fixing in the street-lamps, the maximum working pressure is first put on at the works, the lute is filled with mercury, and the apparatus fitted. The gas pressure will at once raise the bell and keep it up. Sufficient weights to just overcome the pressure are then put on the bell, to force it on to its seating. The weights are in a convenient form, being made of leaden discs of various thicknesses, and slotted to fit round the guide-rod. They are also shaped to the top of the bell. The burner being fitted, the bye-pass completed, and pilot-jet lighted, the apparatus is ready to work.

Our method of operating the system at Tipton is to first see that the maximum working pressure is on the town. The operator then places a weight on each station governor, which throws an additional 1½ inches pressure. I have had these weights specially made and fitted with handles for convenience in handling. They are left on for thirty seconds and then removed, and the pressure subsides to its ordinary level. This very simple and mechanical action by the operator has the result of lighting all lamps fitted with the apparatus. What takes place at the lamps is this: The extra pressure overcomes the resistance of the weights holding the bell down, causing it to rise and take the pendulum up with it. The pendulum is, however, caught against one of the teeth of the ratchet-wheel, which is therefore pulled round, and brings one of the holes or slots in the ratchet-wheel opposite to the gas-way in the valve. The gas is then free to pass to the burner, where it is ignited by the pilot-jet and the lamp lighted. On the weights being taken off the station governors and the pressure reduced to the normal, the weights on the bell of the apparatus force it down on to its seating once more; and the pendulum pin, sliding over the ratchet-wheel and catching in the next tooth, is ready for the next application of extra pressure. At midnight, the weights are again applied to the station governors, causing every second lamp to be extinguished and only one burner in cluster lamps left burning. At dawn, the weights are put on once more, and the remaining lamps are extinguished. At the next operation, of course, all light up again. In all cases the maximum working pressure is put on the town before the weights are applied.

In the earlier form of this apparatus, the outlet valve consisted of a swivel-pipe, one end of which was open and dipped into a mercury cup to seal it when it was desired to extinguish the lamp. When the bell rose, the pendulum lifted this swivel pipe out of the cup and so allowed the gas to pass to the burner. On the bell rising again, the pendulum lifted the other end of the swivel-pipe, sealing it in the mercury. To ensure the pendulum lifting each end alternately, there was a triangular shaped piece of iron under the centre of the pipe. There being a difference of position of the apex of this triangle in the two positions of the swivel-pipe, it caused the pendulum pin to run up each side of the triangle alternately. This type did not, however, stand the test of the heavy traffic at Tipton; the vibration sometimes causing the pipe to come into a neutral position, so that the pendulum might catch on the wrong end. The swivel-pipe was therefore abandoned in favour of the present valve, which is surer and presents greater advantages. On the top of the bell a cover I is fixed, which extends over the lute and prevents any small piece of glass, putty, or other foreign substance falling therein and jamming the bell. The cover is recessed at each side round the guide F, so that the bell works freely up and down this guide and is prevented from turning. The guide-rod, pendulum, outlet valve, and guide F, are made of brass, the body in cast iron, and the bell of pressed steel. There is very little to get out of order; and, if necessary, the apparatus can be worked by hand by merely raising the bell and allowing it to fall back again. It usually requires a little adjusting in the first month after fixing, owing to the action of the mercury on the bell. We have had two years' experience of this apparatus, and are thoroughly satisfied with it; and I hope shortly to get our installation completed and the whole of the lamps in the town fitted.

A pressure-worked apparatus in considerable use on the Continent, and also at Rochester and one or two other places in this country, is the "Bamag," a German patent, which derives its name from the initials of the makers—the Berlin Anhaltische Maschinenbau Aktien Gesellschaft, a large Continental firm of gas-plant makers. It has no seals of any kind; being a purely mechanical contrivance. The case (fig. 7) is of cast iron, and is divided into two sections by a diaphragm C. The back space A, through which the gas passes, contains the mechanism and the valve D. The front space B communicates with the atmosphere, and contains a spring by which the apparatus is regulated to work at the desired pressure. This spring abuts against a centre plate on the



Front Elevation. End Elevation.

Longitudinal Section.

Fig. 7.—"Bamag" Mechanical Lighting Apparatus.

diaphragm, and is contained between that and another plate working on the spiral slot on the shaft connected with the lever F, by which the compression of the spring can be varied to overcome any pressure of gas on the other side of the diaphragm from 2 to 7 inches—the various pressures being marked and divided into tenths on the dial round which the lever turns. Attached to the centre plate of the diaphragm is a rod G, the other end of which is connected with the operating mechanism. The gas inlet is shown at H, and the nipple of the burner at I; the valve being immediately below, and forming part of, the nipple.

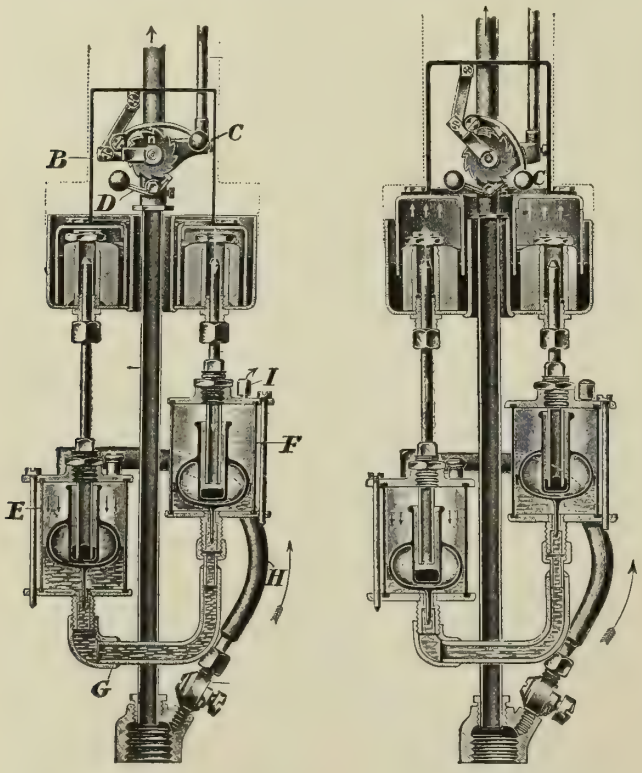
The apparatus is sent out locked by means of a cam at J to secure the machine against damage in transit. This having been set by means of a key, and the apparatus fixed inside the lantern, the lever F is turned to the position on the dial indicating the pressure at which it is desired that the apparatus shall operate, and is then fixed there by a lock-nut K. As soon as the pressure of the gas supply is increased to the amount indicated by the pointer F, the resistance of the spring E is overcome, and the diaphragm forced back, carrying the rod G with it. This, in turn, pulls a vertically hung strip of brass, which pushes a lever acting upon the ratchet wheel L and moves it so that the pawl M rises to the top of one of the teeth, stopping there until another wave of pressure shall operate the mechanism once more. In rising to the summit of the tooth, the pawl lifts one end of a balanced plane N, on which the spindle of the valve D rests, thereby lifting the valve off its seating and allowing gas to pass to the burner. The extra pressure being taken off leaves the mechanism in the position just taken up. On the application of

the extra pressure once more, another movement is given to the rachet-wheel, the pawl M drops into a notch, bringing the plane into a level position again, and the valve comes on to its seating, extinguishing the gas at the burner. By means of a brake action, the ratchet-wheel can only take exactly the required travel to bring the pawl to the summit of a tooth, and from there into a notch alternately.

This is one form of the apparatus. Another is constructed to operate, not upon the immediate application of the necessary extra pressure, but upon its subsequent reduction. That is to say, when the special weights are placed on the station governors nothing happens; but on their removal, the lighting or extinguishing takes place. They are also constructed, as with Alder and Mackay's system, to cut off certain lamps at the second application of pressure, while leaving others on to the third.

It is claimed by the makers that, if desired, the point of operation can be made within the maximum working night pressure; thus dispensing with the peaks on the pressure chart. The full night pressure being put on would light the lamps; and this pressure being kept on does not affect the apparatus in any way. Before extinguishing, the pressure must be reduced to the day level. Being raised to the night level again, the extinguishing is accomplished and the pressure finally reduced to the day level. Personally, I would not like to risk this arrangement; there is not sufficient margin of safety. Presuming that the pressure acted at each lamp to the proper extent, and that each apparatus worked perfectly, it would be absolutely necessary that the pressure all through the lighting time be kept above the operating point of any apparatus, and below it during the other part of the twenty-four hours. With the variations in load in most districts, and the improbability that every apparatus would be tuned exactly alike, this would I think be a difficult matter. To prevent air pressure on the back of the diaphragm affecting the working of the apparatus, the space B communicates with the atmosphere by means of a small passage drilled through the spindle carrying the lever F. To enable a lamp to which the apparatus is fixed to be lighted by hand, a lever O is provided, which, on being turned over from right to left, depresses by means of a cam, the end of the plane N, causing the other end to lift, and raising the valve from its seat. The interior mechanism is made of brass and works easily.

A pressure-worked automatic lighting apparatus which has attracted much attention recently is Dr. Rostin's patent. This has been adopted at Tottenham, where there are over 1200 fitted and in use. They are also being tried in London and other towns, as well as being in use on the Continent. It appears to be rather complicated and delicate in its working parts, though I understand it is giving satisfaction at Tottenham, where it has now been in use nearly two years. The basis of the system in this lighter is the action of a small gasholder, in rising, upon a ratchet-wheel attached to the gas-cock. Unlike Messrs. Alder and Mackay's system, the bell is not weighted, and the apparatus consists essentially of two separate working parts. One part, forming the actual operating mechanism, comprises the gasholder, which is annular and surrounds the gas-pipe, the ratchet-wheel attached to the cock, and the pawl for turning same, together with the catch or brake. The other part merely consists of two cylinders



At Rest. In Operation.

Figs. 8 and 9.—Rostin's Pressure Worked Automatic Lighter.

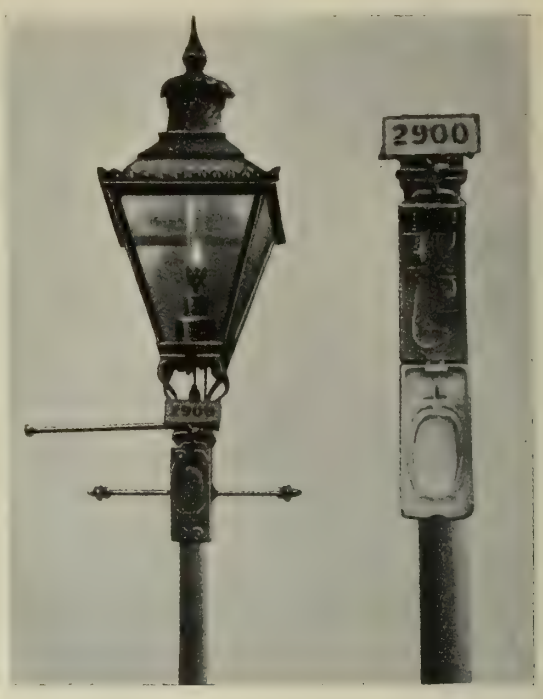


Fig. 10.—Rostin's Apparatus as Attached to a Public Lamp.

containing special floats, the object of which is two-fold—to admit gas to the holder when the right operating pressure is reached, and to provide an escape for the gas from the holder when the pressure is reduced to normal, and the bell falls to rest.

The gasholder is fixed to, and surrounds, the gas-pipe, just below the cock. To the bell is attached a guide B, slotted on one side for the lever of the pawl C to pass through; the lever resting on the bottom of the slot, so that, on the rising of the gasholder bell, it is forced upwards by the guide, and the pawl turns the rachet-wheel, the latter being prevented from working backwards (when the bell subsides and the pawl slips back) by the pawl or catch D. The two glass cylindrical vessels E and F, which are connected with each other by the pipe G, each contains a glass bulbous float made with a sealing cup, into which the inlet and outlet tubes of the holder dip. The two floats are formed with a short rod at the bottom, which acts as a guide, working loosely in the outlet at the bottom of the vessels. The bulbs float in a mixture of glycerine and water. A little mercury in the cups of the bulbs forms the sealing medium for the inlet and outlet tubes of the gasholder, and the bell of the gasholder is also sealed in mercury.

The gas supply from the service is connected to the top of the cylinder E by the pipe H, as well as to the burner cock; this being the cylinder from which the inlet tube to the gasholder is taken. On the top of the other cylinder is a vent I, to allow for the discharge of gas from the holder when the bell comes to rest. The normal position of the apparatus is shown in fig. 8. The gasholder bell is at rest, the pawl levers occupy a horizontal position, the gasholder inlet tube is sealed in the bulb cup, and the outlet tube is unsealed. On the pressure in the mains being raised to the predetermined working point, it acts, by way of the pipe H, upon the liquid in the vessel E, forcing it thence into the vessel F, thus causing the glass bulb in the vessel E to drop and unseal the inlet tube to the gasholder, and at the same time force up the bulb in the vessel F and seal the outlet tube. The gas has thus free access to the gasholder, but is sealed off at the outlet. This causes the bell to rise, the guide B lifting up the pawl lever, the pawl turning the ratchet-wheel and opening the cock, and allowing the gas to pass to the burner, where it is lighted. This gives the position shown in fig. 9. On the pressure being reduced, the liquid runs back from the vessel F to the vessel E; the float in the latter rises and seals the inlet tube, stopping the flow of gas to the holder, and at the same time the float in the vessel F falls with the subsidence of the liquid and unseals the outlet tube. The bell thereupon drops; the gas in it passing, by the outlet tube and vent I, into the atmosphere. With the falling of the bell, the pawl comes into a horizontal position once more, and the apparatus is ready for the next operation.

The pressure at which this apparatus is to work is regulated by the variation of the relative levels of the two cylindrical vessels. Ten minutes is the length of time given as advisable to keep the operating pressure on, in order to ensure the whole of the system working; but the patentee claims that the operating pressure can be made to correspond with the maximum night pressure—thus saving the necessity of extra pressure. It is interesting to observe that practically the whole pressure of the gas is exerted upon the pawl turning the cock.

If desired, the bye-pass and pilot-jet can be replaced by electric ignition. This, while being an ideal method of lighting, would add very materially to the cost of the installation, would entail more expense in maintenance, and would, I fear, prove very little more reliable than the pilot jet.

Two members of the Midland Association (Messrs. Fletcher Stevenson and Berridge) are also, I believe, patentees of automatic street lighters,* and doubtless they will take advantage of the discussion to introduce them to us.

I have dealt with the principal automatic controllers on the market, and have endeavoured to explain the main points and method of working of each. As to the merits of clockwork *versus* pressure, or of individual apparatus, that is a matter which each must weigh and decide for himself. Circumstances will have a good deal of bearing on the question in many cases. With clockwork, the time is inexorably set; and the mechanism cannot be put in operation a little earlier should a dark or foggy day happen. On the other hand, no variation of pressure will affect them, and no special pressures are required for their working. They are pretty reliable, though clockwork is very susceptible to dirt, and, therefore, liable to get out of order. It is, however, in all the controllers I have dealt with very well protected, and there is no doubt gives very good service. The pressure types require less individual attention; and they are all operated at will from one centre. Should a dark or foggy day happen, the lamps can be lighted immediately artificial light in the streets becomes necessary and without trouble. On the other hand, they all demand caution with the working gas pressure to ensure that they do not come into operation at wrong times—indeed, a little carelessness might well result in a lot of trouble. Apart from this, there is no doubt about the handiness and convenience of the pressure system. As regards the liability of individual controllers getting out of order, this will perhaps vary with different patents; but as between clockwork and pressure generally, the chances are, in my opinion, about even.

One thing that must be insisted upon in adopting any of these systems, if it is to be a complete success, is that the lanterns should be in good condition and as windproof as possible. We are dependent upon the pilot-jet; and it is of little use the controller operating if this be out. It is so small as to be very susceptible to any draught in the lantern, and, given a number of old leaky lanterns and a high wind, there would be a strong chance of many lamps failing to light up owing to the blowing out of the pilot-jets. The pilot-jet, too, is by no means perfect. It is liable to failure from three causes—blowing out, sooting-up, and asphyxiation by the products of combustion. If it is situated in the burner-head after the Welsbach system, the possibility of its being blown out is lessened by reason of the protection afforded by the mantle; but the tendency to sooting-up is increased. If the bye-pass tube be carried up the outside of the chimney or glass, and the pilot-flame projected across the top, it does not readily soot-up, but is rather more liable to blow out in a draughty lantern. In running the bye-pass in this manner, it is advisable not to have the tube projecting over the chimney, owing to the liability of the pilot-flame being asphyxiated by the products of combustion from the burner and extinguished. Messrs. Alder and Mackay have introduced a special pilot-jet burner (the patent of Mr. Anderson), burning with a bunsen flame from four orifices, which they claim will not soot-up and will be more difficult to blow out than the ordinary pilot-jets.

The claim is made for each pressure-operated apparatus that it is so sensitive that it will work with a difference of 2-10ths pressure. This is no doubt true, and can be done in the laboratory; but it is not practicable in the practical work of street lighting. Any irregularities of consumption cause greater fluctuations of pressure in the mains than 2-10ths. A pressure chart, which I had taken off a street-lamp within 30 yards of where a large gas-engine was at work, showed unmistakably when the engine was started and when it was stopped. It must further be clearly understood that the extra pressure put on at the station governor does not reach each individual apparatus at the lamp-head undiminished by any means. Should there be a main none too large, supplying works with big gas-engine power or with other large consumption off it, a proportion of the extra pressure is absorbed by this consumption. The same thing occurs if the extra pressure is applied just at the moment when everybody is lighting up. There is then a big pull on the mains, and the extra pressure is partially absorbed by it. If the lamp services are small or partially choked, this, of course, tends to aggravate the matter.

As to what extra operating pressure is advisable, this is largely dependent upon circumstances. A small compact town with regular consumption and no factories making sudden demands on the supply or as suddenly dropping it, and mains and services sufficiently large, would naturally be safe with a lower excess than a town with the opposite of these conditions. At Tipton, I have some of the worst conditions to work under, and I have adopted an excess of 1½ inches above ordinary maximum working pressure. This, I know, is more than ample; but it gives me a good margin of safety against fluctuation and absorption of pressure. In any case, however, and with any pressure apparatus, I should not adopt less than 1 inch excess. If you adopt a sufficiently large excess of pressure, you have more certainty of the system working regardless of fluctuation of pressure, absorption by large consumers, or partially choked services, than if you work with a closer margin. The gist of the matter is that if the operating pressure does not reach the lamp, the apparatus will not operate; and every time the operating pressure does reach the lamp, it will operate, whichever may be the pressure system adopted. For this reason, I do not favour the suggestion of Dr. Rostin and the Bamag people to make the operating point of their apparatus correspond with the night pressure, so that, when the latter is put on, the lamps will light without any excess being applied. The increasing day loads of gas consumption, from the growing popularity of the use of gas for cooking, heat, and power, do not warrant such a difference between day and night pressures as would give a sufficient margin of safety in working in this way, against fluctuation of pressure in the mains at various points of the district. I do not believe in discouraging the use of gas in the daytime by stinting the pressure during those hours, and only putting on sufficient for the period of darkness. If reasonable and sufficient pressures are given for day and night, then there cannot be a sufficient margin of safety; and to attempt to work in this way is to court trouble and risk the apparatus getting crossed. Their very sensitiveness would make the trouble more certain.

As to the time required for the extra pressure to be kept on, to be sure of operating at every lamp, Dr. Rostin advises that it be continued for ten minutes for his apparatus; the Bamag people advise 2 minutes for theirs; while at Tipton I have found that 30 seconds is amply sufficient for operating the Alder and Mackay apparatus. Pressure travels with extreme rapidity. At two miles distance, the increase of pressure is practically synchronous with the action at the station governor.

In adopting a pressure-worked system, it is also necessary that the lamp-services should be of proper size. In most cases this is so; but I have heard of ¼-inch pipe being used. The service should supply the lamp alone, and not a house or two in addition. If the service is too small, the lighting will probably take place all right; but when the operating pressure is put on to extinguish, so much of it will be dissipated in the burner that the apparatus will not act. This I discovered quite accidentally in the course of my experimenting.

One drawback to a pressure system may be found in towns where high pressures have to be worked to, and where there are wet meters in use. Personally I am no advocate of wet meters for consumers. They are more expensive and troublesome than dry ones, and little, if any, more accurate in average working. For some reason many of them are only made to stand 3½ or 4 inches pressure, though why any meter should be made not to stand 6 inches I do not know. I had a number of old wet meters in use at Tipton, and the first effect of the automatic street lighting on them was unfortunate. I have, however, had them altered to stand 6 inches pressure, and thus got rid of that trouble.

And now as to the advantages of adopting a good system of automatic street lighting. I do not think there can be any doubt on this matter. Apart from the satisfaction given by simultaneous action at the right times, the saving in wages, gas, mantles, and chimneys is an important item. We have 456 lamps in Tipton; and before introducing automatic lighting, we employed five lamplighters as well as a youth to attend to, and maintain, the incandescent burners. When the installation is complete, these will have been replaced by two lamp attendants, whose duties will be to clean the lamps, attend to and maintain the incandescent burners, and see that the automatic apparatus is working properly. They will be provided with a tradesmen's tricycle each to carry the cleaning cloths, mantles, chimneys, &c., and a folding ladder clipped to the side or end of the box. In addition, they will have bicycles to ride round after lighting time to see that all lamps are alight, and if any require attention. It is not necessary to ride down every street for this purpose. This represents a saving in wages of over £200 per annum. The saving in gas by not having the lamps alight in daylight, and by being able to reduce the lighting by half at midnight, I will leave each one to calculate for himself. As to the saving in mantles and chimneys, under the old lamplighting system we averaged out 12 mantles and 9 chimneys per lamp per annum. Where the automatic lighting apparatus has been fixed, this has been reduced to 6 mantles and 0·15 of a chimney per annum.

As to failures, there are a few isolated cases of lamps not lighting; but these are in nearly all cases due to the pilot-jet having gone out. In one instance, failure was due to a partially choked service. These failures do not amount to more than about 1 per cent.; and as we get more used to the system, and with improved pilot-jets, I do not doubt that they will become rarer still. The action and working of the apparatus are so simple and so sure when properly regulated, and there is so little to get out of order, or very likely to do so.

Discussion.

Mr. A. T. Harris (Market Harborough) said the paper was undoubtedly of much interest to all towns. He was quite of Mr. Stephenson's opinion, that a better advertisement should be made of the public lighting than some of them accomplished. He was working under a public authority; but he was in the fortunate position of having an authority who gave him a perfectly free hand in public lighting, with the result that they claimed in his district that they had one of the best lighted towns in the Midlands. But he thought, bearing in mind what the President had told them that day, that the efficiency of the Tantalum electric lamp was 1·8 watts per candle power, as against about 4 watts with the carbon filament lamp, that there was more need to give greater attention in the future to the public lighting than they had done, because these figures showed that the consumption of

* See "Journal," Vol. XCIII., p. 501; and Vol. XCIV., p. 647.

electricity would be reduced more than one-half. Mr. Stephenson had told them that he had been troubled with the apparatus lighting-back at the burners. He (Mr. Harris) had about 106 Gunning controllers in use; and he found that was so with certain makes of burners, but it was not so with others. But the makers had also produced a controller with which there was instantaneous lighting. It had a sliding plane upon a disc, revolving upon which was a lever that slid upon the sliding plane. It was also fitted with a pendulum; and the action of the apparatus was instantaneous on the turning on of the lamps. This had overcome the difficulty of lighting-back with the burners with which there had been trouble. With regard to the Alder and Mackay apparatus, he had experimented with this. He fixed it in the district very near the works, and also at the far end of the district; and under all conditions, he found there was not the slightest trouble with regard to the working of the apparatus. It was perfect in every respect. In one case, the apparatus was fixed at the dead-end of a 1¼-inch service-pipe (about 300 yards long) that supplied two lamps; and the action there was all that could be desired. They, however, got one little trouble. The holder from which they generally supplied the town gave a pressure of 44-10ths, and they usually maintained an evening pressure of 34-10ths, so that they had 10-10ths above the maximum evening pressure for lighting. They experienced no trouble through increasing the maximum pressure 1 inch. By midnight, they had reduced the pressure to 20-10ths; and consequently to extinguish the midnight lamps (half), they had to increase the pressure to 25-10ths. They then had complaints of the hissing of the burners, and also through a number of bye-passes being extinguished in bed-rooms. With this exception, the apparatus was perfect in every respect. He should like to ask Mr. Stephenson the pressure he maintained, and if he increased his pressure by 15-10ths. He thought that Mr. Stephenson must, to put his controllers in action, be maintaining an excessive pressure. Mr. Stephenson also stated that he had got his mantles down to six per lamp per annum, and his chimneys to 0·15 per lamp per annum. He (Mr. Harris) made out that this was under one-sixth of a chimney per annum, which gave a life to the chimneys of seven years. He thought Mr. Stephenson was to be congratulated on finding a chimney that would do this under ordinary circumstances. Was it a fact that he had found a chimney that would last seven years in his lamps?

Mr. Stephenson: We have not had the apparatus in use for seven years yet.

Mr. H. E. Copp (West Bromwich) thought Mr. Stephenson had covered the ground of automatic lighting up to date in a very efficient manner. If they went in for these automatic controllers to any great extent, it would mean a considerable capital expenditure; and it occurred to him whether it would not be possible to run an electric wire for lighting up for even less money than perhaps the lighting of a town could be done by means of these automatic controllers. He had not considered any system; but he thought that, perhaps, by means of an electric wire and some simple magnet, the lighting might be done very easily. He had not heard of the system being tried; but he had wondered why it should not be. He had had experience of a number of the controllers to which Mr. Stephenson had referred—both controlled by clockwork and pressure. One clockwork apparatus he had tried on quite a large scale. But he had come to the conclusion that the clockwork form of controller would not be the automatic lighter of the future; and if there was a preference at all, he thought that the apparatus of the future would be one operated by pressure from the works. As to the cost, when one got beyond £1 15s. or £2 per lamp, he thought it put the whole thing out of court. There was still an amount of supervision and labour required when they had the apparatus. This was his own experience. Then there was the question of meters. Mr. Stephenson said he saw no reason why meters should not be made to stand a pressure of 6 inches. Nor did anyone else. But he (Mr. Copp) would like to know how Mr. Stephenson had made his wet meters stand 6 inches, for he found generally the cause of meters blowing was through the screw being left out; and one never discovered who had left out the screw. [Laughter.] Then as to the time of putting on pressure. Mr. Harris had referred to the question of extinguishing at midnight; and the objection to the additional pressure. This, of course, was a very important point; and, although he (Mr. Copp) had not turned out any lamps at midnight, for that reason he should rather fight shy of the system. Then there was another point which everyone would have to consider for himself. It was, "Are your mains overworked?" If they were, it seemed to him that it was going to be very difficult to apply this automatic lighting by means of pressure.

Mr. Charles Meiklejohn considered the paper justified his temerity in "commanding Mr. Stephenson to stand and deliver one." He thought there was a little bit of Irishism in the early part. The author stated that under the ordinary method half the public lamps were lighted before they were needed, and the other half were not lighted until after they were wanted. [Laughter.] He, as Hon. Secretary, had been in the fortunate position on this occasion of being able to send out copies of the paper to the members before the meeting; and, as a result, he had received a letter from Mr. J. T. Lewis, of Wellingborough, bearing on one of the automatic controllers to which Mr. Stephenson had referred, and also Mr. Harris. This was the Gunning apparatus. He thought that the members would be interested in hearing what their friend at Wellingborough had to say. Mr. Lewis wrote—

> The paper is one of considerable interest at the present time; and I congratulate Mr. Stephenson upon it and the results obtained at Tipton with the pressure system. For the past eight months all the public lamps of this town have been lighted and extinguished by means of Gunning's automatic controllers. The ordinary lamps are fitted with the No. 1 controllers. With this controller, the gas is gradually turned on and off; the time taken for each operation being from eight to ten minutes. The 300-candle power self-intensifying Welsbach lamps are fitted with No. 3 controllers. The gas with this pattern is turned on and off instantaneously. Our experience is very favourable to this system. It is a rare thing to have a defective No. 1 controller. The levers of the No. 3 pattern are, however, liable to get stiff in action and to stick when extinguishing should take place. We occasionally have this happening; but as we have considerably reduced the number of such failures, I am confidently looking forward to ultimate freedom in this respect. When we first commenced to use the controllers, much annoyance was caused by the erratic action of some of the controllers, brought about by the time-keeping of the clocks. Some gained so considerably that before the week was out they lighted up an hour or more before the proper time; others lost so much that they did not light up until an hour or more after the right time. This state of things was soon remedied by the makers; and I think it much to their credit that so few failures of the clock now take place. I see no reason why, with greater practical experience of their use, they should not be able to make them perfect in all respects. I quite agree with the author that with this system, the lanterns must be thoroughly sound and windproof. The pilot-light is so easily blown out if this is not the case, and the system of control undeservedly brought into reproach.

He (Mr. Meiklejohn) thought this letter was very interesting, inasmuch as the whole of the public-lamps at Wellingborough were operated by one of these systems. He had himself had half-a-dozen of the Alder and Mackay controllers under experimental observation; and he was somewhat fascinated by the apparatus. He thought it was very simple and efficient in working. But he did not think there was any necessity for 1½ inches extra pressure in operating the governors. The margin might be for safety; but he had found a tolerably large margin—say, of 3-10ths or 4-10ths—was quite sufficient for operating the governor. There was the possibility of a little friction in the rising of the bell; but not sufficient to justify the 1½ inches of extra pressure. He could not see the advantage or efficiency to be obtained from a pressure (say) of 4 or 6 inches on the ordinary wet meter. He was certainly very much afraid of putting anything like this pressure on the meters—all wet ones—in Rugby. His leakage of under 3 per cent. for the last three or four years would certainly tell a different tale if he raised the pressure to 6 inches at night time.

Mr. W. C. Jones (Brierley Hill) remarked that Mr. Stephenson spoke of the public lighting being an advertisement to gas undertakings; and where electricity had captured the public lighting, it was an advertisement for the electricity people. He (Mr. Jones) rather differed in that respect. The best advertisement he had had was when he lost 360 lamps to the Electric Lighting Company. To prove what he said, he might say he met the Managing-Director of one of the large brewery companies controlling houses in his district; and he told him that the canvasser of the Electric Light Company had been to see him with reference to placing electricity in their houses. The Managing-Director said the first question he put to the canvasser was, "Is your Company the one who are supplying the light along the road to Kingswinford?" The canvasser replied in the affirmative; and the Managing-Director of the Brewery Company said: "Until there is some better lighting done that way, you had better not come to talk to me about putting the electric light in our houses." The same Council who turned out the gas some three years ago, were lighting one road in conjunction with another Council—that was to say, their district divided down the centre of the road. The Councils had therefore to light the road one on each side. The Council who had seen the result of the electric lighting in the district of the other Council said they were not going to have electric lighting in their district, but were going to have gas. And there was the spectacle to-day of one side of the road being lighted with gas obtained from the Stourbridge Company, and the other side of the road being lighted with Nernst electric lamps. There they had the best advertisement any gas company could possibly have. Where any council was threatening to adopt electric lighting in the streets, he (Mr. Jones) would be pleased to show them some street electric lighting which would be the best testimony a gas company could have. But, unfortunately, his Company had lost half their lighting. He was very pleased to learn from Mr. Harris and Mr. Lewis that the Gunning clockwork controller had been greatly improved since it was first introduced. Four years ago, he tried about 40 of them. But, unfortunately, they did not give him sufficient satisfaction to warrant him in going on with them. He had tried one or two of the other patterns Mr. Stephenson had shown them; and the only really satisfactory clockwork one he had had to deal with was the one the author had said little about. That was the apparatus made by Messrs. Falk, Stadelmann, and Co.; but the price put it absolutely out of court. A point he should like some explanation upon was in the last paragraph of the paper. The author anticipated—and he (Mr. Jones) hoped it was true—that he would save about £200 per annum when he had got all his lamps fitted with these controllers. He should really like to know whether the £200 per annum was on the actual lighting, and not on cleaning the lamps also. If

Mr. Stephenson had 450 lamps with only two men to see that the lamps were all alight, and to do the cleaning and maintenance, they would in his (Mr. Jones') opinion, be insufficient, because Mr. Stephenson must be using these men for cleaning as well as lighting. In his own district, he found, on account of the difference in level, it was impossible for one or two men to get round the lamps in one evening in anything like the time; so that he could not save the amount of labour that Mr. Stephenson held out as possible.

Mr. W. W. Townsend (Hereford) said there were one or two points he should like further information about. There was no doubt that the question was now not would these automatic controllers work, but what would they cost to be installed. He had been considering the question of lighting Hereford. He had the same arrangement in existence that Mr. Stephenson had had—the lamplighters started about one hour before dusk, and finished about an hour after dusk. The author claimed that there was a saving of gas by putting in automatic lighters; but he (Mr. Townsend) could not see any. On the contrary, he found there would be more gas used, because they had got the pilot-lights going all the year, whereas, under the old system, they began to light some lamps before it was dark, and they began to extinguish the lamps before it was light. If he put in automatic lighters costing 30s. per lamp for installation, the question was whether it would pay or not. Where was the capital and the interest to come from? No doubt the saving in labour was great; but he doubted whether it was really sufficient to pay for the whole of the cost.

The President said with regard to the statement in the paper relative to pleasing everybody, he thought they had all come to the conclusion long ago that it was quite impossible to do so. They must carry out their work on the lines which they knew from their experience were the best for their undertakings; and they must not endeavour to pander to the tastes of Jack, Tom, or Bill. Mr. Stephenson's phraseology very much reminded him of Æsop's fable of the man, the boy, and the donkey with which, he had no doubt, members were all familiar. The last speaker had mentioned a point he was himself considering, regarding the cost of installation, and the cost of sinking fund and interest on the capital, in connection with a system of automatic lighters. He had estimated that, with a system of 500 burners, there was first of all 750,000 cubic feet of gas per annum to be expended for the bye-passes. In practice, in Stafford, where they had had rather fewer than 500 lamps lighted by pilots, they actually saved by the abolition of the bye-passes over 1½ million cubic feet, which normally went down to leakage. This must be taken into account first of all. Assuming his figure of 750,000 cubic feet to be correct, there would be a direct loss there; and for those of them who adopted a system of lighting street-lamps which was dependent upon pilot lights there would thus be a money loss of £75 under comparable circumstances. The installation of the controllers would cost, roughly speaking, about £900 to £1000; and there would be, at 10 per cent., a loss of £90 to £100 per annum there. Taking the two figures, they amounted to £165 or £175 per annum, which would be the cost in his case of lighting the lamps. They had four lamplighters; and he came quickly to the conclusion that it would not be profitable for Stafford to light with automatic appliances. One firm he had a little bit of fun with—he thought it was the Gunning Company. He sent for a sample lighter; and he told the Company, after considering these points, that unfortunately the lighter failed in one respect—it would not clean the lanterns. He entirely agreed with Mr. Stephenson with regard to the necessity of keeping up pressures in the day time. Many of them in old towns were suffering, and would continue to suffer for years, from the very small mains that had been laid in the towns, and which had to be renewed from time to time. Where such mains existed, he took it a pressure system of automatic lighting would be most difficult. He thanked Mr. Stephenson for his excellent paper.

Mr. Stephenson said he was very pleased with the reception that had been accorded to his paper. He had rather hoped to have had a little more fight than he had had; he had certainly tried to get it. Mr. Harris had informed them that the Gunning Company now made a lighter that would work instantaneously. He believed that Mr. Harris also said that some kinds of burner would light-back where the controllers were in use, while others would not. He (Mr. Stephenson) believed the kind of burner that was very liable to light-back was the inverted one, which was being taken up to a large extent for street lighting. Mr. Copp had a very effective display of them. Then Mr. Harris said there were complaints of the hissing of the burners with excessive pressures, and of bye-pass jets being extinguished in bed-rooms. He (Mr. Stephenson) confessed he did not understand this; but he took it, as Mr. Harris said it was the case, that it was so. Anyway, he had not had such complaints at Tipton. Mr. Harris also inquired what was the maximum pressure at Tipton. It was 37-10ths, which was, he knew, fairly high. They had, however, to give it, or the consumers did not get the necessary supply of gas and light. Regarding the point as to the chimney, he could not say he had a chimney that had lasted seven years, simply because he had not had the apparatus in use seven years. They kept an account of the mantles and chimneys; and the mantles and chimneys used by each street-lamp were debited to it. The figures he had given represented the average so far as their experience had gone. Mr. Copp suggested an electric form of street lighter, which was interesting in its conception; but whether it would cost less than an installation of some of the automatic lighters referred to in the paper, he could not tell. It was not at present a practical thing, and it was only put forward as a suggestion. He quite agreed with Mr. Copp that any form of lighter that cost more than 35s. could be ruled out as quite out of the question. He did not see how it could pay to instal at the price. That supervision was necessary whatever lighters were adopted, he agreed entirely. It was no use installing an apparatus, and thinking it would go by its own sweet self without any attention at all. When he stated that under the old system of lighting half the lamps were lighted before they were needed, and the other lamps were not lighted by the time it was dark, he did not intend to convey the interpretation that Mr. Meiklejohn had given to the statement. With the Alder and Mackay apparatus, Mr. Meiklejohn did not consider that 1½ inches excess pressure was needed—that it was too great a margin. Neither did he (Mr. Stephenson) think it was needed. As he had stated in the paper, the Tipton gas-supply district was a peculiar one; and they had to make quite sure that the arrangements would work. But it remained for experience to prove what was the best pressure in a town like Rugby. He thought with Mr. Meiklejohn's level district, he should be able to work on easier lines than they did at Tipton. Mr. Jones, of Brierley Hill, seemed to look with great equanimity upon the loss of a large number of street-lamps to the electric lighting folk. When he (Mr. Stephenson) saw a chance of an electric lighting station taking some of their street-lamps in the Tipton area of gas supply, he did not regard it with equanimity at all. If the electrical people put up bad lamps for street lighting, these undoubtedly were not a good advertisement for them, any more than it would be for gas suppliers if they put bad lighting into the streets. But supposing the electrical people put in a good installation of electric lighting, and did not mind the expense, they undoubtedly got a fine advertisement, and gas had lost it. At West Bromwich, they had some fine electric lamps in the High Street, which was well lighted.

Mr. Copp remarked that it was one of the finest lighted streets in the world. They had about 1½ miles so lighted.

Mr. Stephenson (continuing) said Mr. Jones did not see how he was making a saving of £200, and he thought two men were not enough. Whether they were enough or not, he (Mr. Stephenson) had the voluntary assistance of his Committee in working out this little matter. They went in detail into the question as to how many lamps should be cleaned; and they decided that two men could do the work. He took their word for it, and the saving would work out, when the difference in wages was considered, to more than £200. Mr. Jones did not see how the men could get round to see every lamp in an evening. But it was not necessary to go down every street. If they went down the main roads, they could see at a glance whether a lamp was out in the side streets. Mr. Townsend was not convinced there would be a saving in gas, because, in the ordinary way of lighting, the lamps were lighted before dark and extinguished before it was light. Possibly that would bring about an average condition; but his own experience was that there was always a tendency to err on the side of daylight, so as to have as few lamps unlighted after dark as possible. Both the President and Mr. Townsend said something about the waste of gas through bye-pass jets. Mr. Pooley had worked it out as a saving of leakage by abolishing bye-passes. This came to the point in the paper where he objected to making profit the chief thing in street lighting. The first thing should be a satisfactory system; and profit a secondary matter. [In a communication received from Mr. Stephenson since the meeting, he says: "With regard to the pressure I carry, our works lie rather high in relation to the district. With reference to cost of installation raised by one or two speakers, the total cost of ours with the Alder and Mackay arrangement will come within £1 per lamp. I omitted also to reply to a question by Mr. Copp as to wet meters, that we had altered those that needed it to stand 6 inches pressure."]

Thanks to the Retiring President.

Mr. T. Berridge (Leamington) proposed a vote of thanks to the retiring President for the admirable way in which he had conducted the affairs of the Association during the past year. The interesting address Mr. Stevenson gave them twelve months ago came to memory, as well as the manner in which the Association were entertained at Coventry in May. Nor did any of those present forget that Mr. Stevenson was a member of a family renowned in civil and gas engineering.

Mr. S. Glover (St. Helens), in seconding the proposition, said they were thanking Mr. Stevenson for having done something he had enjoyed doing. Those of the members who did not know Mr. Stevenson before, had found that he was a man who devoted himself strenuously even to presidential duties, and he took infinite pains to perfect himself, and to carry out the duties in that pleasant manner which was natural to him.

The President endorsed these remarks. Having served for a short time on the Committee, he must say Mr. Stevenson had carried out the duties of the chair in a most efficient manner.

Mr. Stevenson, in thanking the members, said Mr. Glover had taken the words he was going to use out of his mouth. Mr. Glover had said he was sure he (the speaker) had enjoyed his year of office. He had. He felt that a great honour had been done him; and he therefore did his utmost to do what he could for the Association. He did enjoy the work very much; and in the work he had had the help of the members all through.

SOCIETY OF BRITISH GAS INDUSTRIES.

The Annual General Meeting of the Society was held last Wednesday, at the Holborn Restaurant. Administrative matters first occupied attention.

The SECRETARY (Mr. Arthur L. Griffith) read the minutes of the last annual meeting and of the November meeting; and they were confirmed.

CHAIRMEN OF SECTIONS AND HONORARY OFFICERS.

The elections of office-bearers were also made:—

Mr. W. P. GIBBONS represents Section I. (Retort-Settings).
Mr. T. S. CLAPHAM, Section II. (Exhausters, Purifying Plant, Residuals Plant, Retort Mountings, and Condensers).
Mr. F. J. WEST, Section III. (Conveying Plant and Labour-Saving Machinery).
Mr. J. W. BROADHEAD, Section IV. (Gasholders).
Mr. JOHN MACKAY, Section V. (Meters).
Mr. JAMES W. WILSON, Section VI. (Gas-Stoves).
Mr. THOS. G. MARSH, Section VII. (Gas-Fittings, Lighting Burners, Governors, and Scientific Apparatus).
Mr. J. E. WILLIAMS, Section VIII. (Manufacturers and Contractors not included in the Foregoing Sections).
Mr. H. N. BICKERTON, Section IX. (Gas-Engines).

Mr. CHARLES CLARE, *Honorary Secretary.* } *Ex-officio Members*
„ H. M. THORNTON, *Honorary Treasurer.* } *of Central Council.*

ANNUAL REPORT—INSTITUTION OF GAS ENGINEERS AND STANDARD CLAUSES IN CONTRACTS.

The Central Council presented their first annual report as follows:—

In submitting the first annual report to the members of the Society, your Council believe that some useful work has been accomplished during the last twelve months, and that the Society is becoming better understood in the gas world generally.

The idea at first prevalent, that it was intended to be a menace to gas engineers is, we believe, dying out, and its proper sphere as a body for mutual consultation is becoming more recognized.

Nearly the whole of the firms engaged in the meter and gas-stove trade and the construction of carbonizing plant and machinery have already joined the Society, and among its members are included firms representing practically every branch of the gas industry. Nine additional influential firms have become members this year; and it is anticipated that the membership will be considerably increased in the near future.

In February of last year, the Society had a valuable paper, on "Contracts and Specifications," read to it by Mr. C. E. Brackenbury. As the outcome of that paper, a meeting has been arranged between the Institution of Gas Engineers and representatives of the first four sections of our Society, to discuss the question of standard clauses in contracts; and it is hoped that much good will ensue from that meeting.

During the latter part of the year, the gas-stove section had meetings with the Gaslight and Coke Company in connection with the Gas Company's scheme of entering into business relationship with the London ironmongers; and an agreement was entered into which appears to have given satisfaction not only to our Society and the Gas Company, but to the ironmongers as well.

It was with the greatest pleasure that your Council were able to inform you last autumn of the acceptance of the first presidency of the Society by Mr. Dugald Clerk. Mr. Clerk is so highly respected and well known both to gas engineers and to our own members, that we feel his acceptance of the position has been of the highest importance to us, and that it is a happy augury for the future welfare of the Society.

A notable event in the past year was the first annual dinner of the Society, held last November at the Holborn Restaurant. It was a pronounced success; and the presence among us of so many well-known gas engineers, and their evident pleasure at being with us, helped to cement the feeling of good fellowship between gas engineers and gas-works manufacturers and contractors, which is one of the great objects that the Society has in view.

An admirable paper was read at the meeting immediately preceding the dinner by Mr. Walter W. Thomas, Past-President of the Society of Architects, entitled "Some Uses to which Gas has been and can be put, with Advantage to the Public and Manufacturers." Various points were touched upon which showed that closer relationship was advisable between architects and members of the Society; and your Council have under consideration suggestions to enable this to be brought about.

The Smoke Abatement Society has been doing some valuable work during the past year. Our Society regrets, however, that the restrictions placed by the Royal Sanitary Institute on the admittance of flueless gas-stoves in their exhibitions have not been removed. Your Council hope to get more into touch with these two bodies in the course of the year.

An arrangement has been come to with the Manchester Institution of Gas Engineers so that the forthcoming Exhibition at Manchester will be under the joint auspices of their Institution and our Society; and the details of the Exhibition are to be arranged by a Joint Committee of the two bodies. It is hoped by this means that a successful result will be obtained in October next.

The report was adopted.

THE MANCHESTER EXHIBITION.

The members unanimously resolved to give the Manchester Gas Exhibition their hearty support, and appointed the following gentlemen to serve on the Advisory Committee, with the Manchester District Institution of Gas Engineers: Mr. Dugald Clerk, Mr. Charles Clare, Mr. F. J. West, Mr. Thomas G. Marsh, Mr. John Mackay, Mr. J. W. Broadhead, and Mr. J. E. Williams.

Following the business meeting, an ordinary meeting was held—the PRESIDENT (Mr. Dugald Clerk, M.Inst.C.E., F.C.S.), in the chair.

PRESIDENTIAL ADDRESS.

Some Possible Improvements in British Patent Law.

In this country of ours, we British appear to be somewhat continuously inspired with a healthy discontent with things as they are. This discontent and depreciation of our own country generally coincide with an appreciation of other countries, and, may I say, sometimes with an exaggerated notion of the benefits or advantages enjoyed by natives of countries outside of ourselves. Other countries by no means possess this characteristic of depreciation. America, for example, always has a good opinion of herself, and Germany does not lag far behind. We in England are accordingly somewhat inclined to accept the rosy view of the condition of things outside ourselves, and the gloomy view of things within ourselves. Naturally, the British Patent Law does not escape its share of depreciation; and to read the writings of one party, it would be imagined that here in England we have the worst patent law possible, while the laws of America, Germany, France, &c., are immeasurably superior to ours.

I quite admit that British Patent Law could be improved; but after a somewhat extensive experience of the effects of the patent laws of our own and other countries upon manufacturers and inventors, I am by no means inclined to agree in the comparative estimate so much now in fashion. It should not be forgotten—as apparently it is forgotten by many who write upon this subject—that the British Patent Laws form the model upon which the whole of the patent laws of the world have been framed. We in Britain had earlier patent laws than any other nation; and both in our Colonies, in America, and on the Continent, the laws of various countries are essentially framed upon the British Patent Law. There are differences between the different countries, and no doubt some of these differences are improvements upon our law; but taking a broad view of the whole matter, in my opinion, our British Patent Laws are superior to those of any other country. In saying this, I speak from an experience of nearly thirty years, both as an inventor, a patent expert, and a manufacturer. I am certain that if, to take two examples, the patent laws of America or Germany were to be suddenly made the Patent Laws of England, we should have in the country a much greater outcry than exists at present. Englishmen would certainly strenuously object to the patent laws of either Germany or America. America, it seems to me, errs somewhat in leaning to the side of the inventor against the advantage of the general public, and in promoting somewhat trivial inventions. Germany appears to err on the other side, of too great severity on the inventor—greater severity, by the way, on the native German applicant than upon the foreign applicant. England occupies an intermediate and, in my opinion, a more just position.

It is interesting to compare the patents granted in several countries, in order to arrive at some estimate as to the respective activity of the natives of the different countries as inventors. Taking the year 1904 as the latest in which all numbers can be compared, I find as follows:—

Patents Issued to Native Inventors in 1904.

United States	27,539
United Kingdom	8,070
Germany	5,904
Austria	1,357

The native inventor of the United States thus appears to be the most active. Next comes the inventor of our own country; and then Germany. These figures, however, require adjustment before any true comparison can be made. The nature of the patent laws of the different countries must be considered. In America, the law as to unity of invention is very severely enforced, with the result that an invention which is covered effectually by one English patent requires three separate patents in America. It is quite usual indeed to find that the subject-matter of a single patent granted in England requires even more than three American patents to be covered in accordance with the American law. The American law, for example, allows of no alternative claims in one patent specification. One invention must be dealt with only; and two methods of carrying out that invention are not allowed in an American patent. If there be two methods, or if there be two matters independent of the main claim, these matters must be made subject of separate patents in America. This remark is also true to a less extent of Germany. German law requires more numerous patents to cover a given invention than English law. Because of this, it is difficult to arrange the numbers of patents issued in the different countries in such a way as to show with any accuracy the number of separate inventions in the British sense covered by the different patents. If, however, the American patents issued be divided by three, the number of inventions protected in the States to native inventors will be more closely approximated.

It is more difficult to deal with the case of Germany; but in my view a more true measure of the inventive activity of the

natives in each country is obtained by placing the issued patents as issued inventions in the following order: United States, 9200; United Kingdom, 8000; Germany, 5000. Considering that the population of the United States is about 80 millions, that of Germany 60 millions, and of England just over 40 millions, it follows that the natives of the United Kingdom are the most active in the world in the inventive field in proportion to the population. I am aware that this differs from the usual view, according to which the United States are always placed at the head of the list. This, in my opinion, is due to the fact of the great number of issued patents in America, and the lack of adjustment of ideas as to the number of inventions covered by those patents. The English number, 8070, I should say, includes all patents issued to Colonials; but in the year under discussion, only 432 of such patents were issued.

Each country issues patents to foreigners; and the total number issued to foreigners in 1904 was: United Kingdom, 7019; United States, 3285; Germany, 3283; Austria, 2763. From this it appears the percentage of the total issued patents in 1904 going to foreigners were: In the United Kingdom, 46·5 per cent.; in the United States, 10·6 per cent.; in Germany, 35·7 per cent.; in Austria, 67 per cent. That is, in England nearly one-half of the total patents issued were granted to foreigners; in the United States, only a little over 10 per cent.; in Germany, more than a third; and in Austria, the high percentage of 67. These figures clearly show that the United States and England are by far the most important countries from the inventors' point of view. More inventions are produced by natives of the United States and the United Kingdom than any other country.

From these numbers it appears that we in England issue more than twice the number of patents to foreigners that is done either in the United States or in Germany. This proves that England is regarded by foreign inventors and investors in inventions as the leading field for profitable development. Accordingly, it is undoubtedly important to consider the question which is at present very prominently before the country—that is, the question of compulsory working. It is urged by one party that, as the Continental countries impose compulsory working upon English patentees in those countries, we in England should put similar disabilities upon Continental and other inventors. There can be no doubt whatever that the Continental compulsory working clauses impose great hardship upon British inventors. It by no means follows, however, from this circumstance that the imposition by England of similar hardships upon foreign patentees in England would be to the advantage of England as a whole. It would be foolish to impose penalties upon foreigners, unless it could be seen that our country would benefit thereby.

It is always difficult to predict the effect of the alteration of the law in any given country. Alterations have so often produced very opposite effects to those intended. It seems accordingly reasonable to consider if the compulsory working laws in force upon the Continent have benefited the countries concerned. In considering this, it is desirable to inquire whether Continental countries are contented with their laws as to compulsory working. It does not appear, so far as I can discover, that Continental manufacturers are really contented. It is not generally known that, as far back as 1892, Germany concluded a treaty with each of the following countries—viz., Austro-Hungary, Italy, and Switzerland, and these countries concluded treaties with each other to the same effect. The countries had in full force compulsory working laws as to patents. The object of the treaty in question was really to avoid the inconveniences which each country felt were due to these laws of compulsory working. Under Paragraph 5 of the German Treaty, it was provided that if an invention, design, or trade mark was worked in any of the countries concerned, that would be held to be a working for all the countries; and, further, that the importation of goods manufactured under the patent into any of the countries from the others would not invalidate a patent, trade mark, or design. This treaty has been in force for many years in the countries mentioned; but it was not extended to Belgium and France, because, I suppose, these countries were not on sufficiently good terms with Germany or the other countries of the Triple Alliance to have the privileges extended to them. I am informed, however, that at the present moment negotiations are going on between France and the countries named to enter this combination, which, in effect, forms a Union. Manufacturers and inventors in all these countries have repeatedly protested against the working laws; and the modification now referred to is the result of their objections. From this it is quite evident that Germany most certainly did not consider herself to be in any position of advantage due to compulsory working, as against Austro-Hungary, Italy, or Switzerland. It seems to me that, in view of the unfavourable experience of the Continental countries of compulsory working, it would be most unwise for us to address ourselves to the question of introducing compulsory working here. Our far better course would be to set our diplomatists to work to frame treaties with Germany and the other countries I have mentioned, whereby working in England would be held equivalent to working on the Continent. That is, to attack the problem from the point of view of removing the disability from the English patentee on the Continent, rather than putting the disability upon the Continental patentee in England.

Having regard to the fact that in 1904, 2140 English patents were issued to German subjects, it appears probable that pressure enough could be put upon the German Government, in ways which will readily occur to you all, to get our own disabilities removed, and put us upon an equality on the Continent with the native inventor. Even under such an arrangement we might still maintain our compulsory license clauses, as is done in Switzerland. In the final protocol of the treaty with Switzerland, the following addition is made to Paragraph 5 of the Treaty: "Losses of right which according to the laws of the parties take place for patents of inventions in case of refusals of granting licenses are excluded from Paragraph 5." That is, Switzerland reserves to herself the right to revoke patents of a nature sufficiently important to make it desirable that licenses should be granted in Switzerland itself. Of the 7019 British patents granted to foreigners in 1904, 3051 were granted to natives of the United States of America, 2140 to Germans, and 780 to French subjects.

I have ample experience of the uncertainty in the value of patent property introduced in all Continental countries by the laws of compulsory working against Britain and America. It appears also that Germany has been considerably hindered in her development by the existence of those laws. Fewer inventors and manufacturers consider Germany a field worth exploiting than would be the case if patents were more secure and more easy to uphold. It is to the interest of every country, in my view, to have as many inventions as possible of the best kind, whether native or foreign. Undoubtedly, unless our manufacturers use the most up-to-date and economical appliances, and the best substances and products produced by the world, they would speedily fall behind in the race. The effect of the German law against British inventions appears to me to be this. The anxiety of the British patentee in Germany as to the laws of working prevents him from exporting his invention to Germany as early as otherwise would be the case. Consequently, the German nation suffers by getting English inventions which would be useful to it at a much later date than need be. On the contrary, England gets immediate advantage of any invention produced in Germany. This is good for the English people, and good for the English manufacturer, although he does not always like it. It results in England always having within her borders examples of the very latest machines and products produced in Germany or any other part of the world. This is stimulating to the business man as well as to the inventor, and no doubt is one cause why invention in England is so much more active in proportion to population than it is in Germany.

In my view, a very great mistake is often made by supporters of the compulsory working idea in confusing patent property with protective tariffs. A patent has nothing to do whatever with protection when properly viewed. A patent is a means of securing to an individual his intellectual property, and is no more protective or monopolistic in its nature than a policeman is protective in preventing one man from taking money from his neighbour's pocket. The Patent Law recognizes a right in intellectual property, just as the Common Law recognizes the right of individuals to the property they have earned. I object therefore to the Patent Laws being described, as some describe them, as substitutes for protective tariffs. It appears to me that only those who believe in Protection can see good in any scheme which hampers the free import into this country of inventions and the products of inventions of all kinds. I quite agree that it is necessary for a country to reserve to itself the right of compulsory license; and I would gladly see compulsory licenses made easier in England by introducing a cheaper procedure for the settlement of cases.

The Patent Office in itself is an admirable tribunal; and I see no reason why compulsory licence cases should not be tried before the Comptroller of Patents, with power of appeal (say) to the Court of Appeal, but not to the more expensive tribunals of the House of Lords or the Privy Council. I understand that the present Parliament intend to take up this question; and I trust that they will deal with it rather from the point of view of removing disabilities from the English patentee abroad, than placing similar disabilities upon the foreign patentee here. We are much indebted to the foreign patentee for a great part of the prosperity of England; and I for one should be sorry to see his rights curtailed because of what appears to me to be the foolishness of Continental Governments in the present treatment of this country. I have little doubt that, seeing the importance of the English market in patents to Germany, it would be easy to persuade that country to relax the laws as to working of English patents in Germany, if our Government took the matter seriously in hand. I look forward with interest to the Bill, which I understand is shortly to be made public, and prefer to say no more now on that point.

There are other points in our British Patent Laws which appear to me to be of much more real importance than this question of compulsory working. It seems to me that there are five matters which would greatly improve our patent law, if they could be incorporated into a new Act. They are as follows:

1.—One or more invalid claims should not invalidate a patent for invention.
2.—Disconformity between provisional and complete specifications should not be open for discussion except before the Comptroller of Patents.
3.—A patent for invention should not be invalidated by a prior publication or user older than fifty years.
4.—Patents of addition should be granted without requiring renewal fees.
5.—The term of the British patent should be increased to seventeen years.

With regard to the first point, British inventors and manufacturers suffer greatly owing to the very considerable expense of supporting the validity of their patents in Courts of Law. In America, the expense is still greater; in Germany, it is less. Several modifications could be made in the law which would, in my view, reduce the uncertainty and increase the security of the inventors' patent property without in any way trenching upon the rights of the general public. In all patent actions before our Courts, a patent may at present be invalidated if any one of the claims is found to be anticipated or rendered bad from any other cause. It is difficult to see why one invalid claim should make the patent invalid, provided that the remaining claims include sufficient subject-matter, and are not anticipated. In many other countries—America, for example—the presence of one or more invalid claims in a patent is not held by the Courts to invalidate; and an action for infringement does not fail because of the existence of such a claim, unless it be the claim of which infringement is alleged.

With regard to the second point, another matter which leads to endless difficulty in the Law Courts is that of disconformity—that is, disconformity between the provisional and the complete specification. Hardly a patent action is fought in which this plea of disconformity does not appear. In my view, the question of conformity of the complete with the provisional specification is one which might very properly be left entirely to the Comptroller; and his decision or acceptance of a complete specification should be final. That is, the point of disconformity should not be raised in the Courts at all unless on the one ground of fraud. If the Comptroller and his assistants pass the documents as conformed, this point, it seems to me, should not again appear in any patent litigation.

With regard to the third point, the expense of patent actions is greatly increased by the question of invalidation by prior publication or prior user. The present law has determined that no patent shall be held to be invalid because of any publication by prior English specification of earlier date than fifty years before the patent date. This provision of the present law greatly improves on the former conditions; but it seems to me that it does not go far enough. If it could be altered so that no patent was invalidated by any publication or prior user in Britain older than fifty years before the date, then matters would be greatly simplified. If an invention has lain hidden for fifty years, it appears to me that the person who gives it to the world afresh has as good a claim on the State as the original inventor. For all practical purposes the invention has been lost to the world for fifty years; and it has been re-invented at the later date.

Under the fourth point, apart from cheapening litigation, there are other matters which would greatly improve the position of the patentee. In most foreign countries—including Germany, France, Italy, and so on—"patents of addition" are granted of later date than the original patent, but expiring with the original patent. These patents of addition are granted with only the expense of the necessary filing fees; but they do not increase the renewal fees to be paid in subsequent years. In British law, there is no provision for a patent of addition; and, as a consequence, inventors in progressive industries are obliged to obtain a long series of patents—each successive improvement being the subject of a separate patent, and requiring the payment during its life of the whole of the renewal fees. For every patent which runs its full term of fourteen years, the present fees exacted by the Government amount to £100. This sum forms a most serious tax upon the inventors or manufacturers who are obliged to maintain a considerable number of patents. It seems to me that the system of patents of addition, as carried out in foreign countries, could very well be adopted by us. It is true that the total fees earned by the Patent Office would be considerably reduced; but surely a Government Office like the Patent Office should not be run for a profit.

Under the fifth point, in most of the important inventions which have appeared, it is found that fourteen years is much too short a term to enable the invention to be developed sufficiently to provide reasonable remuneration for the inventor and the manufacturers interested. In many inventions within my knowledge, including some of my own, it has taken fourteen years to fight out the difficulties of the workshop and public user before the invention gets on a paying basis at all. Take, for example, the steam-turbine—an invention now prominently before the whole world. Mr. Parsons, at the end of the term of one of his fundamental patents, found it necessary to apply for a prolongation; and the Privy Council granted him an extension of five years. This was necessary, because Mr. Parsons' invention, although one of the utmost importance to the whole world, had taken him fourteen years to develop scientifically and commercially; and at the end of the fourteen years he found himself with a quite insufficient monetary return. In my view, our extreme term of patent—fourteen years—is too short. In Germany, France, and Italy the term is fifteen years; in Belgium, it is twenty years; and in the United States of America, seventeen years. It seems to me that the country would do no more than justice to the inventor by extending the patent term from fourteen to seventeen years.

One provision of the American law would be very useful in this country—that is, a provision by which an application for patent is not invalidated by a reasonable prior public user by the inventor himself. The American law permits the inventor to obtain a valid patent if he applies for it within two years of its publication and use by him in the States. In our law, an invention must not be publicly used or published in any way by the inventor before he applies for the patent. There seems no reason why the American method should not be adopted.

The President said he did not wish it to be felt that he was taking advantage of his position to force upon the Society his opinions; and he should be glad to reply to any questions that were put to him.

Mr. Charles Clare said, arising out of the question of the compulsory working of patents, his idea was that the granting of patents was not so much for the pecuniary welfare of the man who brought out the invention, as to create fresh industry and work in the country in which the patent had been taken out. Therefore if they granted a foreigner a patent for a certain thing, and he did the work in his own country, it debarred the people here from touching the work until at least fourteen years had expired.

Mr. J. W. Broadhead remarked that it seemed to him that the new patent law which came into force last year would materially affect the proportion of the figures given by the President.

Mr. F. J. West pointed out that one of the matters which the President said would improve their patent law was that one or more invalid claims should not invalidate a patent for an invention; and later on he said: "It is difficult to see why one invalid claim should make a patent invalid, provided that the remaining claims include sufficient subject-matter, and are not anticipated." He (Mr. West) was under the impression it was the case at the present time, that if a patentee withdrew an invalid clause from his patent, he could file his patent again with the clause excepted.

Mr. T. G. Marsh said he was scarcely at one with the President regarding the matter of compulsory working. This was a particularly prominent matter just now, and one upon which he believed Mr. Lloyd-George was about to introduce some amendment into Parliament. The President said that there could be no doubt the Continental compulsory working clauses had imposed great hardship upon British inventors. It by no means followed from this circumstance that the imposition of compulsory clauses in England would inflict hardship upon foreign patentees. But unless it would be to the advantage of the country as a whole, it would be a very foolish thing indeed to impose penalties upon foreigners. A little further on, the President properly said that the patent law had nothing whatever to do with tariff reform; but a patent was practically a monopoly. In general terms, he (Mr. Marsh) had an objection to monopolies; but there was no other way that he knew of of paying a man for his ability, his time, and his brains. As an inventor and manufacturer, this matter of the patent law was a serious one for him. It took trade from this country; and the inventor was frequently unable to work his invention, and obtain royalties on the Continent.

The President inquired whether Mr. Marsh ever succeeded in getting royalties on the Continent for his own inventions.

Mr. Marsh said he had.

The President remarked that Mr. Marsh had been a fortunate inventor.

Mr. Marsh replied that he had got thousands of pounds, though he had had some difficulty in doing it. Here came the point. The President said that England did not suffer so much as the inventor. He had an invention with several others—it was an invention in which they were pioneers—and in Germany and France the invention had found employment for thousands of hands. If he had been able to put his foot down, and say he would manufacture these things on his own works, he would have done so, and these hands would have been employed in this country. The consequence was the country was losing; while he (Mr. Marsh) was gaining, to a certain extent, by getting royalty. From his point of view, if the country gave an individual a monopoly, the country ought to get some return from it; and a condition might be the requirement to manufacture in this country within three years from the granting of the patent. This would give a foreigner the opportunity of finding out whether his patent was likely to be valuable in this country. It would give him every justice, it would pay him for his brains, and it would compel him to manufacture in this country. Otherwise, the foreign patentee would manufacture at home, and send his productions over here for sale; while British patentees were compelled to manufacture their inventions in other countries. The President also said that "we are much indebted to the foreign patentee for a great part of the prosperity of England. . . . I have little doubt that, seeing the importance of the English market in patents to Germany, it would be easy to persuade that country to relax the laws as to the working of English patents in Germany, if our Government took the matter seriously in hand." If some such arrangement could be made, he (Mr. Marsh) would be quite with the President. He believed that why German patents were worked here so much more than in Germany was because there was more capital and more speculators in this country than in Germany. As to America, that country had not more inventors than this country; and their patent laws were in some respects more objectionable.

The President said he knew the members would give him credit for desiring the prosperity of the country as much as Mr. Clare and Mr. Marsh. He himself was an inventor. His first work was purely and simply engineering invention; and he had felt the full force of the disabilities of the foreign patent laws

against English manufacturers. He was in full sympathy with Mr. Clare and Mr. Marsh with regard to foreign patents granted to British subjects. As to the method of getting over the disability, the one favoured just now by many was to put the disability upon the foreign inventor, and not remove the disability from the English inventor. Mr. Clare perhaps sympathized more with the manufacturer than the inventor. As an inventor, he (the President) looked upon the manufacturer as his natural enemy. [Laughter.] He did not think the granting of a patent was entirely for the benefit of the nation. Every man who invented a thing that produced a new industry was entitled to some reward for the act. He quite agreed it was a great wrong on the British inventor that disabilities should be put upon him on the Continent by the compulsory working clauses. If he saw that they were really going to increase employment in England by taking the same course, he would be with Mr. Clare and Mr. Marsh ; but he did not believe it. It looked a plain and straightforward thing. But it was like the question of protection ; it looked all right till one examined it. In the present patent law, there were very good compulsory licensing clauses. The only thing that had prevented these clauses coming into effective operation, and doing everything that Mr. Clare and Mr. Marsh could wish, was the expense of the tribunal. It was really the unwieldiness and the expense of the litigation and the uncertainty of the clauses that had prevented them being universally used by manufacturers. The law as it now stood, if it could be used with the least possible expense, was a good law. His way of redressing the grievance would be not by putting a disability on the foreigner, but by removing the disability from British inventors in other countries. The Otto gas-engine was a German invention, and a German patent. He himself suffered very severely under the patent in the early stages of the gas-engine industry; but that did not prevent one from seeing that the existence of the Otto patent in England was the cause of great prosperity to England. No manufacturer would have cared to have gone to the expense for plant, unless or until he saw some chance of recompense. If they allowed everybody to make, no one would touch an invention. Everybody wanted some sort of individual right. Mr. Broadhead had inquired whether it was not a fact that the new patent law had altered the condition of things in this country. According to the Comptroller's return for 1905, in the year 1904 there were 22,461 applications for patents, and in 1905, 19,819. The Comptroller took the view that this difference was not so much due to the stringent nature of the new law as to the fact that many inventors had an idea that there was an advantage in rushing in the patents before the new law came into force. This was rather borne out by the fact that in November and December there was a rush to escape from the new law. In 1906, the applications rose again. Mr. West spoke of one bad claim not invalidating a patent, if the bad claim was removed, and the patent was made good. That was true. If, however, Mr. West was fighting a patent action, and it was discovered, as generally happened in the middle of the action, that one of the claims was hopelessly invalid, then he would not be allowed to stop the action in order to remedy the claim. He would have to take the consequences; and the action would be decided against him, and he would have to pay all the expenses up to that point. Many people would in consequence fight through a thing, in order to avoid such a catastrophe. If the action were continued by leave of the Court, it would be found that there was a limit to what could be recovered in the way of infringements, so that all the infringements might be wiped out by the action. He congratulated Mr. Marsh upon having got so much from the continentals, having himself found it very difficult to get anything at all; so that gas-engines were apparently more difficult to negotiate than gas-meters. On the question of the employment of many hands, he thought they did not quite realize how many capitalists came from foreign countries, notwithstanding the assumed disabilities this country laboured under.

Moved by Mr. CLARE, and seconded by Mr. WEST, a hearty vote of thanks for his address was passed to the President, who briefly responded.

The President called upon Mr. C. E. BRACKENBURY, Barrister-at-Law, to read a paper he had prepared on the "Prevention of Corruption Act."

Preceding the paper, Mr. BRACKENBURY remarked that he should like to add his appreciation of the very interesting and instructive address the President had delivered. There was only one thing with which he hardly agreed, and that was the reflection he seemed to cast on certain legal gentlemen. He (Mr. Brackenbury) had been an engineer for sixteen years; so that personally the President's remarks did not affect him. At the same time, he hardly thought they were fair, because, on the President's own showing, the legal procedure in this country was so admirable, the British patent laws so simple, the procedure in the Courts so quick, and the examination and cross-examination of experts so rapid, that here in these respects things were far ahead of America and other countries.

The PRESIDENT assured Mr. Brackenbury that the legal profession were great friends of his.

Mr. BRACKENBURY (proceeding) said that the simplicity he had spoken of was also found in the Act the Council had asked him to expound. He then read the paper, of which the following is an abstract.

PREVENTION OF CORRUPTION ACT, 1906.

The author began by pointing out that more than three hundred years ago—to be exact, in 1584—the Barons of the Exchequer, in considering whether certain copyhold estates came within a particular statute, unanimously arrived at the following resolution: "That for the sure and true interpretation of all statutes in general (be they penal or beneficial, restrictive or enlarging of the common law) four things are to be discerned and considered: (1) What was the common law before the making of the Act; (2) what was the mischief and defect for which the common law did not provide; (3) what remedy the Parliament hath resolved and appointed to cure the disease of the commonwealth; and (4) the true reason of the remedy. Then the office of all the Judges is always to make such construction as shall suppress the mischief and advance the remedy, and to suppress subtle inventions and evasions for the continuance of the mischief *pro privato commodo*, and to add force and life to the cure and remedy, according to the true intent of the makers of the Act *pro bono publico*." The author said that as these rules of interpretation had been commended in recent times, and seemed to him to be peculiarly adaptable to his short consideration of the Act for the Prevention of Corruption which has lately come into operation, he proposed to adopt them as the framework of his exposition. He then proceeded to review the state of the law before the passing of the Act, and at the outset showed that the proposition that, wherever there exists a fiduciary relationship between two or more persons, the law requires that there shall be complete openness in all transactions, had been laid down over and over again. He cited various cases in support of this statement, and passed on to give a few extracts from judgments bearing upon the question of profits or commissions, which, being judicial *dicta*, would, he thought, be more valuable than any remarks of his own. He next dealt with the plea of "custom," which has on several occasions been attempted to be put forward as a defence to an action. Of course, where the practice of an agent being paid by commission is well known and recognized, the generality of the usage was, he said, such that a principal must be presumed to have knowledge of it; and, further, there was nothing secret or undisclosed about such *bonâ fide* trade customs. It was a very different thing, however, when it was alleged that a custom prevailed which flew in the face of the fundamental doctrine of the law of principal and agent—viz., that in such a fiduciary relationship there must be the utmost good faith. No plea of custom could prevail for secret commissions that undermined such relationships. This had, he said, been laid down in several cases, which he cited.

Having briefly stated the available remedies, Mr. Brackenbury called attention to the defect for which the law did not provide—viz., the gift bestowed in consideration of favours conferred in the past, and in the hope of more to come in the future ; and he then offered some observations on public opinion and legislative measures in connection with his subject. This brought him to the third branch of it, in which he considered the remedy appointed by Parliament to "cure the disease of the commonwealth." Having given an epitome of the Prevention of Corruption Act (6 Edw. VII., cap. 34), the scope of which has already been indicated in the "JOURNAL," the author proceeded to look into its real meaning. He acknowledged that at first the interpretation of the Act appeared to be rather difficult ; and, no doubt, wherever a question of corruption or intention to corrupt was involved, there was bound to be some little trouble in determining what cases came within or were beyond the scope of the Act. Every case must necessarily be decided upon its own particular facts and circumstances. But the author thought that we should not be very far wrong in our conclusions if the chief points of the law of principal and agent, and the state of things the Act was intended to remedy, were borne in mind ; if, further, the analogous enactments relating to corrupt and illegal practices at elections were considered ; and, above all, if our common sense were used.

The first difficulty that arises in the interpretation of the Act is the word "corruptly"—"if any agent corruptly accepts," &c. In the author's opinion, to accept a gift corruptly is to accept it in violation of a legal duty. It is our duty to obey the law ; and if a statute says that certain transactions and gifts shall not be permitted, and we persist in them, we break the law, fail in our legal duty, and the act is done "corruptly." Some judicial observations on this word, arising out of election petitions in the year 1869 were cited, and then Mr. Brackenbury passed on to the next difficulty—the words "with intent" in the third clause of the first sub-section of section 1—which makes it a crime for any person knowingly to give to any agent, or for any agent knowingly to use, with intent to deceive his principal, any receipt, &c., which is defective in any material particular, and which, to his knowledge, was intended to mislead the principal. Attention was called to the fact that nothing was said here about "corruptly"—the word used being "knowingly ;" and the phrases "with intent to deceive" and "intended to mislead" are employed. The author pointed out that these three expressions in this part of the section throw a greater burden of proof on the prosecution than in the case of the two foregoing clauses. To satisfy the requirements of the third clause, the state of mind of the person giving to the agent the false receipt, and that of the agent using it, must be ascertained and proved. With regard to the expression "with intent to," it might, he said, have one of several different meanings. It might refer (1) to the sole intent, (2) to one of several concurrent intents, (3) to the principal or

dominant intent, and (4) to the determining intent, without which the act would not have been done. It was difficult to say which of these meanings was to be applied; but he was inclined to the first, as being the most consonant with common sense. In reference to the words "receipt or other document," in section 3 of the Act, he pointed out that three requirements have to be fulfilled. In the first place, the document must be one "in respect of which the principal is interested;" secondly, it must contain some "statement which is false or erroneous or defective in some material particular;" and, thirdly, it must, to the knowledge of the person giving it or of the agent using it, be intended to mislead the principal. "The whole clause," said Mr. Brackenbury, "is, of course, aimed at those dishonest transactions in which a person gives to an agent a receipt which does not show the discount received by the agent; the suppression of the full, true, and material facts being intended to deceive the agent's principal. It does not matter whether the principal be actually deceived or not. It also covers those cases where two or more different accounts are sent for the same parcel of goods, in order that the agent may deliberately use the higher-priced account, so as to get something from his principal to which he is not entitled, and concerning which the principal is ignorant."

The author was doubtful as to the advisability of endeavouring to give illustrative examples of supposed cases that might come within the Act, as each must be judged according to particular circumstances; but he submitted the following: Suppose a contractor was desirous of doing work for a company or corporation from whom he had never received an order, though he had frequently tendered. Hearing that some new work would shortly have to be given out, he sends the agent of the parties a valuable present, which is secretly accepted. Soon afterwards the contractor obtains the contract. Here the contractor, whether he got any work or not, would have brought himself within reach of this criminal law, for he corruptly made a gift to an agent as an inducement for showing favour in relation to his principal's business. With regard to the company's agent, the matter was not quite so clear. If there were no other material circumstances in the case, Mr. Brackenbury was of opinion that the Court would hold that, if the jury found as a fact that the secret gift was accepted to show favour, the agent must be deemed to have corruptly accepted it. The duty of the agent was, he said, "either to return the gift or to advise his principal of it, and act according to instructions." He next took the case of an architect acting as the agent of a Hospital Board in the building of a new hospital or ward. A manufacturer of gas-stoves or any other apparatus agrees to allow the architect a special discount if he will adopt the manufacturer's particular make of stove. If this special discount was not offered *bonâ fide* in a matter of keen cutting business, but as a reward for showing favour, the manufacturer was liable under the Act. If the architect intended to pocket the difference between the ordinary and the special discount, without disclosing all the circumstances to the Board, he also would be guilty under the Act. Further, if the architect merely passed an account before the Board in just the same form as he received it from the manufacturer, without showing on the face of it the special discount, and did this with intent to deceive, he was liable under the third clause of the first sub-section of section 1. The manufacturer would himself be liable to pains and penalties if he knowingly gave the defective account to the architect with the knowledge that it was intended to mislead the architect's principals. These were two instances, said the author, which his audience would be able to add to innumerably far better than he could. With regard to Christmas presents, if a substantial one was offered to an agent, partly in a "Christian spirit of peace and goodwill," but chiefly as an inducement or reward for doing or forbearing to do some act in relation to his principal's affairs, or for showing favour or forbearing to show disfavour, in the author's opinion the gift was brought within the four corners of the Act. This being so, he could only say that the less that honourable men of business had to do with such presents, the better it would be for them, for trade, and for the country.

After offering a few remarks on the futility of some of the defences likely to be set up by people charged with accepting corrupt gifts, Mr. Brackenbury said there were four questions in connection with the interpretation of the Act which he thought might be regarded as test ones to ascertain, at least in part, whether any particular set of acts constituted the newly-made crime. They were these: (1) Was the transaction one which the Legislature intended to hit at? (2) Was the gift intended to serve as an inducement or a reward? (3) Was the gift secret? (4) Would either party care if the principal knew of all the circumstances of the gift? According to the answers given to these questions, a decision might, he thought, be arrived at.

In conclusion, Mr. Brackenbury offered two suggestions for the consideration of members of the Society. The first was to insert, if they were not now in the habit of doing so, in their agreements with agents or servants, and where possible in their contracts, a clause specifying that nothing in the form of a present or bribe should, at Christmas or at any other time, be offered, given, or accepted by or to them, or to any third parties with whom they came into business relationship. This would, he thought, tend to clarify business transactions, and give a contractual strengthening to the morally weaker in resisting attractive and insidious temptations. The second suggestion was that the Council of the Society might well consider the advisability of supporting the efforts of the Secret Commissions and Bribery Prevention League, which had been formed to see that the new Act should not become a dead-letter. One of the objects of the League was "to assist its members and subscribers in any action which may be considered by the Council necessary to recover secret commissions paid or received." As to the attitude of the Society of British Gas Industries towards the Act, he was sure there was only one course to be followed, and that was to have nothing whatever to do with anything that might be brought within the meshes of the criminal law. Two of the objects of the Society were precisely the same as those with which the Act had been passed. He rejoiced in this unanimity of effort, and wished it every success.

The PRESIDENT said he had much pleasure in proposing a hearty vote of thanks to Mr. Brackenbury for his very able exposition of the new Act. The question discussed was a most important one for all of them, because everyone in business knew that certain customs had grown up—sometimes quite innocently, and at other times not so innocently. The Act made it very necessary that now they should look through the practices of their subordinates, so that they acted strictly up to the spirit of honour and also up to the provisions of the new Act, because the Act made certain things very serious crimes which formerly were not so. It was highly necessary, therefore, that they should be very strict in the future; and it behoved every man to judge for himself. Mr. Brackenbury had given them some valuable clues; and he (the President) thought the question: "Is this open and above-board; should we like the principal to know this?" was the best question of all. If all was open and above-board, one never need do anything that one would not tell the principal. There was no doubt about it that these things would have to be inquired into very carefully. In conclusion, the President complimented Mr. Brackenbury upon having been called to the Bar since the Society last had a paper from him, and wished him every success.

Mr. J. W. BROADHEAD seconded the motion. He thought the new Act hardly required any explanation to those who had made up their mind not to give presents, but it did to those who desired to see whether they could ride a carriage and pair through it. He thought if such people would put to themselves the questions that Mr. Brackenbury had just propounded, and conscientiously answered them, they could not go far wrong. There was one thing that Mr. Brackenbury had not touched upon, in summarizing his paper, and that was as to the consent of the Attorney-General or the Solicitor-General being required before a prosecution could take place.

Mr. BRACKENBURY thanked the President and members for their kind vote and congratulations. Referring to Mr. Broadhead's remark, he said the consent of the Attorney-General or the Solicitor-General was required to prevent frivolous charges and actions being brought. He believed this section of the Act was introduced by the ex-Lord Chancellor (Lord Halsbury), and was, no doubt, an essential requirement of the Act.

This concluded the proceedings, and the members subsequently informally dined together under the genial chairmanship of the President.

Scraping Water-Mains.—A contract has been completed by Messrs. Glenfield and Kennedy, Limited, of Kilmarnock, through Sir John Aird and Sons, of London, for scraping water-pipes in Cagliari. The mains dealt with comprised 7½ miles of 15-inch and 3¾ miles of 14-inch pipe. The average thickness of the incrustation was fully 1 inch. The operations, including fixing hatch-pipes and replacing sluice-valves, were carried through within one month. It is stated that a test made of the mains previous to scraping showed a delivery in 24 hours of 952,000 gallons, and after scraping of 1,430,000 gallons, or an increase of 478,000 gallons. This is believed to be the first work of this nature conducted in Italy.

Mr. Dugald Clerk on Flame-Engines.—The Friday evening lecture at the Royal Institution on Feb. 22 was given by Mr. Dugald Clerk, whose subject was "Flame in Gas and Petrol Motors." The lecturer said that mechanical power had been obtained from flame by four methods, or by combinations of them. A plan that was much in favour with inventors at the beginning of last century was the explosion-vacuum method; another, which might be called the atmospheric-explosion method, consisted in igniting a mixture of gas and air at atmospheric pressure in a cylinder; the engine being driven by the pressure produced. The Lenoir engine, introduced about 1860, depended on this principle; and the last representative of it was the Bischof engine. The third method resembled the second, except that the charge was under compression, whereby greater power was obtained from the same charge. The Otto engine, introduced about 1876, was of this type. It had the disadvantage that an impulse was given only once in two revolutions of the fly-wheel; but 25 years ago the lecturer had devised an engine, working on the same principle, in which an impulse was given at each revolution. In the fourth method, explosion was avoided; but the gaseous mixture was ignited as it entered the working cylinder. This method found a representative in the Diesel engine. The lecturer said that the theory of the internal combustion engine would be simple if the specific heat were constant and the ordinary laws of gases were obeyed at high temperatures and pressures; but information was required on these points as well as on dissociation, rate of combustion, &c.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The Question Box.

The February Meeting of the Association was held last Wednesday, at the Cripplegate Institute; the business consisting of the consideration of a number of questions which had been previously sent to the Hon. Secretary (Mr. J. G. Clark) and circulated among the members. There were eighteen questions in all; but the first half-dozen on the list provided a full evening's discussion, and the remainder had to be passed over. Mr. W. Upton presided over a very good attendance.

Has automatic distance lighting now arrived at that perfection when it can be safely recommended to consumers—viz., such arrangements as Bartlett's valves, the pneumatic switch, or similar methods?

The President said it would seem to him that there were two points concerned in this question—had these arrangements arrived at the stage when they could be safely recommended to consumers, and was the cost such as to justify their use? Things like these might be technically perfect, but still the price might prevent their adoption. Mr. Smithers remarked that he had had complaints with the pneumatic switch; but with the electric switch there had, so far as his knowledge went, been no trouble. He had had several installations of the Armaduct system in use for over two years without complaint; so he thought they could safely be recommended to any consumer. The cost was 10s. 6d. per burner. Mr. Rothwell had had a pneumatic switch in personal use; and he had changed the valve once for an improved pattern, which worked perfectly. His Company sold them at manufacturer's list price, and did not allow any discount; and this covered the cost of fixing. In his show-room, they had both the Armaduct and the pneumatic systems; and his experience was that there was less trouble with the latter, because there were no cells to run out. With the former, when the cells were weak, there might be trouble in lighting several burners simultaneously. The list price of the pneumatic arrangement was from 6s. 6d. upwards, with 25 feet of tube, according to the switch. Mr. S. A. Carpenter said he knew of a case in which Bartlett's system was not successful; sometimes it was necessary to try half-a-dozen times before the lamp was lighted up. The price, he thought, was about 3s. 6d. The President remarked that this seemed to be one of the cheapest forms. It was very obvious that there would be a big demand for lighting-at-a-distance methods, as they were certainly at a disadvantage in this respect. Mr. Farquhar regarded the pneumatic switch as better than the electric; as it seemed to him a more positive type of valve. In the case of the electric current being switched on to open the burner after the bye-pass had gone out, of course the gas would not light, and people might go away forgetting to switch it off. With the pneumatic arrangement—especially the one that pulled out—one knew whether the gas was on or off. Mr. Wedd also had had a pneumatic arrangement in use two years, without experiencing any trouble, except perhaps a very faint smell of gas. Mr. Rogers pointed out that, in the case of the electric switch, if it was marked "On" and "Off" top and bottom, one would have some idea of its position. The President said he had had about ten of the electric arrangements in use at his house for three years. There was a good deal of trouble at first; but he put them right, and since then had had nothing to complain of.

A burner of a gas-fire is found to burn with a partly luminous flame. Upon reducing the size of the holes in the gas-injector, the correct blue flame is obtained, but considerably shortened, although the gas supply at the tap is ample. What should be done to obtain a longer bunsen flame?

Mr. Smithers remarked that if they decreased the air supply they got a longer flame. With the latest burners, they could regulate either the gas-way or the air-way; and if there was a luminous flame, they could alter the air-supply so as to get a better result. Mr. Eldred thought that in the case mentioned in the question, the air supply was incorrect. If the gas-injector had been left alone, and the air supply seen to, there would have been a proper bunsen flame of the right length. Mr. Farquhar suggested that possibly the trouble might have been caused by the gas pressure not being sufficient to draw in the amount of air required; while Mr. Rogers pointed out that there was only one correct bunsen flame for a fire, and when this was obtained it was all they could do. When the right point was reached, if they wanted a longer flame they must increase both the air and the gas supply. Mr. Ainsworth said it was necessary to understand the kind of burner used and the size. His opinion was that the inquirer had not got the requisite pressure. He himself had had to deal with as low as 8-10ths pressure; and with cookers this was difficult. Mr. Brown related an experience he had with some ordinary boiling-rings, which had one-third of their flames luminous. He unscrewed the injector, and took it farther back, away from the air-chamber. In his opinion, the trouble referred to in the question was with the injector. In the case he himself had quoted, the injector was too far in the air-chamber. The President, said he thought this quite met the case. Mr. Dawling remarked that there were two sorts of injectors used. With a short injector, one got more air; and he thought that would meet the difficulty in this case. Without a doubt, it was the injector that was the cause of the trouble. Mr. Rosevear said that if a full-length bunsen flame could not be obtained when using the original injector by enlarging the air-inlet, he should suggest using a new injector with smaller holes. If this shortened the flame, he would advocate exchanging the burner for a new one.

Should gas-fires have adjustable flue-outlets?

Mr. Hewett, while admitting that the principle of an adjustable flue-outlet was very well, pointed out that with it a person who had not been properly instructed would be more likely to do harm than good. Mr. Smithers did not agree with having a damper on the flue-outlet. To adjust the flue in any way was dangerous. The President pointed out that the basis of the question assumed that the area of the flue-outlet was properly proportioned in the first place by the maker. Mr. S. A. Carpenter said that no doubt many of the complaints of gas-fires in heating rooms were due to very sharp up-draught. Theoretically an adjustable flue-outlet would be a very good thing; though there was a risk of people not understanding it. Mr. Wheaton suggested the adoption of a valve that would not hermetically seal the flue. He had known dampers to be fitted with successful results; but they could not be closed quite tight. There was a bye-pass, so to speak, left, so that there was no possibility of the fumes being thrown into the room. The general idea was to allow the fumes to escape as soon as possible. Mr. Rothwell remarked that there was a small stove made—suitable to heat a room 14 feet square—with an outlet having a valve that could be partially closed down; and this answered very well. Mr. Wedd asked whether nearly the same effect as by regulating the flue could not be obtained by either lengthening or shortening the flue; but Mr. Hewett said the adjustable flue was intended for the use of the consumer. The whole point turned on the user; and if he did not understand exactly what he was doing, it would be best to leave the flue untouched. Mr. Farquhar did not agree with the regulating flue, because it was apt to be badly used. The position required for the damper one day would probably not be suitable for the next. It was better to have some of the heat wasted up the chimney than to have an unpleasant smell in the room. Of course, a regulating flue, for anyone who would watch it, would be an admirable thing; but the general public did not know enough about the matter to work the thing properly. Mr. Gale had had experience in his office of a case in which there was a down-draught when the wind was in a certain quarter; and he had to substitute a coal-fire for his gas-stove. With this, and a cowl fixed on the chimney, he had little smoke. Mr. Liberty advocated the leaving of the flue quite free. Mr. Ainsworth, referring to the question of down-draught, said he found that in nine cases out of ten if the flue was opened, most of the draught would be found near the fire-place. He had never failed to cure this by carrying the flue into the chimney about 5 or 6 feet, putting a cowl on the top, and filling up the back with sheet iron, in places where they could not possibly use a coal-fire. As to adjustable flues, this was an important point; and he was fully in favour of them, though, of course, he would not advocate a flue that would shut entirely. Manufacturers made flues as small as possible, in order to get better results from the fires. What they wanted was to have the flues sufficiently large to carry away the fumes under whatever atmospheric conditions prevailed. Gas-fires would never be as successful as they ought to be, until there were adjustable flues. The flues could be made in such a form that they would show at once when they were open, when they were half-closed, and when they were as far as possible closed. Mr. Rosevear argued that such flues would be more dangerous than advantageous; but the President thought an adjuster was necessary, though he would have very grave doubts about placing such an instrument in the hands of many of the people they had to deal with.

Which is the most suitable bunsen flame—the hollow or the solid—for incandescent gas lighting?

Mr. Eldred said that, in considering the bunsen flame in connection with the incandescent light, the main object to be secured was great heat on the outside. Therefore it seemed to him they should try to get all the gas as nearly as possible on the outside of the burner—that was to say, on the edge. The gas passing in the centre of the burner was to his mind wasted to a very large extent. Therefore the hollow flame seemed to be the most efficient means of obtaining the greatest heat with the smallest amount of gas consumed, and so getting the best light. Mr. S. A. Carpenter remarked that there was a great tendency nowadays to get an intense heat in a very small compass; and for this he should think a solid flame would be the most suitable. Of course, it was much shorter, and therefore a smaller mantle was needed. The President said this raised another point—was it better to get the light from a small or a large area? The life of the mantle also came into consideration. Mr. Grimwood pointed out that there were two sorts of hollow flames—one very hollow, and the other not so hollow. His experience with the hollow flame on the Muller principle was that it was a poor shape. The gas issued from an annular space all round the burner; and the

flame did not fill the mantle. Mr. Tooth contended that the solid flame was certainly of much more advantage than the hollow one, because the lighting efficiency of an incandescent gas-mantle depended upon heat. A hollow flame would spread on the outside of the mantle; and therefore it was apt to be cooled by the outside air. With a solid flame, the whole of the heat was utilized on the inside of the mantle; and thus a better lighting efficiency was secured. Mr. Rogers inquired whether the highest efficiency was not secured with a Kern burner, which had a hollow flame; and Mr. Tooth replied that the efficiency of this burner was in its construction. There was no doubt, he added, that if the Kern burner could be adapted to a solid flame, it would give an even higher efficiency. Mr. Brown instanced the burner in one particular make of lamp, which originally had a solid flame, but had recently been so altered as to give a hollow flame—with the result that it furnished 25 per cent. more light. Mr. Tooth, however, maintained that the new burner was practically a solid flame. Mr. Ainsworth stated that the Kern burner if properly adjusted, appeared to him to give as good a result as could be obtained. The difficulty would be in getting the hollow flame the proper distance up the mantle; and in order to secure a proper hollow flame, there must be a good pressure. A solid flame could be worked with a lower pressure; but a proper hollow flame might be better and more economical. The President added that there was the "C" burner, which was a hollow flame, and gave a very high duty. Mr. Farquhar said it seem to him that the point of burning was exactly in the meshes of the mantle. The gas came through the mantle, on the front of which the secondary air impinged. If they took away this secondary air, they got very bad results. Mr. Winslow said that, considering high-pressure lights gave better efficiency than low-pressure ones, this pointed to the fact that the solid flame—if it really was a solid flame in high-pressure lighting—was the better of the two. Mr. Rosevear argued that the hollow bunsen flame was more suitable, for several reasons, for incandescent lighting. The chief among these were a larger flame, which filled the mantle better, and the fact that the outer surface of the flame tended to be hotter than the solid flame, owing to the oxygen being consumed at the point of contact with the mantle. These two reasons resulted in a larger light-giving surface of greater brilliancy.

Given about 80 yards of 3-inch main run down a private yard for a supply to a gas-engine in a factory. They afterwards adopt gas for lighting. Does any member know of a plan tried to get rid of the pulsations in the gas-engine service, or a supply off same, so that the lighting would be done from the same service, and so save the cost of laying a new main down the yard?

The President pointed out that the question was rather vague, because they did not know the size of the engine. Mr. Grimwood spoke of one suggestion that he had heard of being adopted. This consisted of putting, in a 3-inch main, a matter of about 6 or 12 inches—he did not know exactly the length—of an 18 or 24 inch main—thus making the gas in the large piece act as a buffer. He could not, however, speak of its success or otherwise. Mr. Farquhar also knew of cases where this had been tried. The service had been cut for some distance, and a length of 12, 18, or 24 inch main had been laid, according to the size of the engine. This acted as a reservoir from which the engine sucked its gas; thus in some cases preventing fluctuation. This had been done because the fluctuation was felt on the service main. Mr. Cheal had met with a very similar instance. A 3-inch main for an engine was taken off a 4-inch one, and run some distance. Afterwards houses were built and supplied from the 3-inch main; and there were soon complaints of fluctuation. This was traced to the pulsation of the engine. Just at this time the pressure of the gas supply on the district was increased by about an inch all round; and since then there had been no complaints. Mr. Winslow said the question was put by him, and for this reason: Of course, there was the ordinary pulsation in the gas-engine; and then there was extra pulsation when the gas-bag became filled and gas was shut off. There was a long length of main—80 yards; and there was no pulsation while the gas-bag was filling. When, however, it became filled, the valve shut off suddenly, and sent the pressure up to somewhere about 4½ or 5 inches—the pressure on the main was only about 2½ inches. Would this be overcome by a larger main being let in? It would be hardly worth while trying such a thing as an experiment unless one was sure it would be successful. Even if they had a larger main, they would still get the pressure and the pulsation in it. Mr. Smithers referred to a similar experience he had some years ago. He found that by putting a double governor on the lighting service, the oscillation was stopped entirely. Mr. Ainsworth said he was for many years in a colliery district, where he had known the pressure to be down to 9-10ths and even 8-10ths, which created considerable difficulty with regard to engines. That undertaking would not supply gas to an engine unless there was a special anti-pulsator fixed. The President said it was usual, with the high-pressure systems in which America had taken the lead, to have what might be called a compressor-tank to take up the pulsation; and the principle of this was identical with the enlargement of the main of which members had spoken. He should feel inclined to believe that if the main was enlarged, or a tank was put in to form a kind of reservoir, this might assist in preventing the trouble.

In case it is found necessary to suddenly shut down the exhausting plant, what would happen in the retort-house, and what should be done to minimize the trouble?

The President remarked that it was pretty obvious what would happen in the retort-house if the exhauster was shut down; and perhaps the main interest centred in what might be done to minimize the trouble. Mr. Farquhar suggested an automatic bye-pass valve, which would come into operation and throw the pressure of all the apparatus and the holder on to the retorts. If the retorts were leaky, there would be a large waste of gas; and there would be a deposit of carbon in the retorts if the breakdown lasted a considerable time. Mr. S. A. Carpenter said that if the inquirer had the old-fashioned luted lids, and bye-passed his washer and worked into the lightest holder, this would to some extent meet the trouble; but there would be considerable loss any way. Mr. Farquhar remarked that working over the exhauster one would as far as practicable reduce the seal in the washer so that it would not give the same back-pressure; and perhaps taking a little off each apparatus, he would save the pressure to some extent. But the method that one engineer might adopt would not perhaps apply to another works. Mr. Barnett said that where there was heavy back-pressure, bye-passing the exhauster would not do. In a case where the holders were giving perhaps 8 or 9 inches pressure alone, it would be a serious business. Even in a works having duplicate exhausters, they might have to shut down the whole of the exhausting plant at once. Mr. Farquhar remarked that in this event it was necessary to stop work altogether. Mr. Barnett said the difficulty would show itself in the retort-house quickly, by all the lids blowing; and the governors would also blow. It was usual to slack off the lids as soon as possible. He did not, however, know whether anyone was aware of a means of blowing the gas away. He thought the best arrangement would be to have a main fitted with a valve, in such a way as to take the gas out through the roof of the retort-house.

MIDLAND JUNIOR GAS ASSOCIATION.

Second Annual Meeting.

The Second Annual General Meeting of the Midland Junior Gas Engineering Association took place last Saturday—Mr. G. W. G. Tatam, the President, in the chair. The items on the *agenda* were the presentation of the report and balance-sheet, the election of officers and new members of Council, and a paper by Mr. W. Wastell (Birmingham) on "Gas-Works Statistics."

The Report and Balance-Sheet.

The Hon. Secretary (Mr. J. Hewett) read the report of the Council and the balance-sheet. The former opened by regretting the resignation of 14 members during the session, but announced with gratification the fact that 24 new members were elected—making the present number on the books 120, as compared with 110 last session. In compliance with the views expressed at the previous annual meeting, the Council arranged a shorter programme this session, consisting of the Presidential Address and five papers; and they were also enabled by the kind invitations of Mr. F. W. Stevenson and Mr. T. Berridge, to include visits to the new Foleshill Gas-Works at Coventry and to the Leamington Gas-Works. The latter visit will take place on the 6th prox. The decision to have the papers (or abstracts of them) printed in advance and circulated among the members prior to each meeting had resulted in more animated discussions, and, the Council believed, had met with the approval of all the members. The average attendance at the meetings during the session was about 45, compared with 55 for the previous session. This decrease the Council remarked was most regrettable—especially having regard to the increased membership of the Association. They hoped it was not to any extent due to the distribution of the papers in advance. The estimated sale of the "Transactions" of the preceding session was more than realized. The Council drew attention to the fact that the statement of accounts showed the financial position of the Association to be very satisfactory. In conclusion, they intimated that an invitation had been kindly extended to the members by Mr. J. A. Mobberley to visit the fire-clay works of Messrs. George King Harrison, Limited, at Stourbridge, and that they proposed to arrange the visit to take place in June. The accounts showed a balance in hand of £25 1s. 5d.

The President said he was sure they would all agree that the report and balance-sheet were eminently satisfactory. The fact that, though the membership had increased, the average attendance at the meetings showed a falling off, was very much to be deplored. Of course, Associations of this description—or, for the matter of that, of any description—always had very large attendances during the first year, and afterwards experienced a decrease; but still, in view of the larger membership, he thought they ought at least to have maintained their average attendance. They were all interested in the Association; and those members who did attend should use all the influence they possessed to get the others to put in an appearance regularly. They would then have longer discussions. The discussions during the present session had been very satisfactory indeed in all respects; but there was no reason why they should not do better—and they would, if the

attendance was kept up. The satisfactory condition of the Association was entirely due to the efforts of the Hon. Secretary and the other members who had attended the Council meetings; but, of course, having left Birmingham, he personally had not been able to be present on these occasions.

Mr. J. H. Darrah (Nechells) remarked that they would have an opportunity at their next meeting of tendering their thanks to the Council; and it only remained for him now to formally move the adoption of the report and accounts, which fully indicated the satisfactory position of the Association. With regard to the attendances at the meetings, the Association could not remain stationary. They must either go backward or forward; and it rested with the members to decide which it should be. He hoped those who did attend would take the President's advice, and use their influence to get others to come.

Mr. L. J. Hoyles (Derby), who seconded the motion, endorsed all that had previously been said with regard to the satisfactory condition of affairs. He added, however, that he would very much like the Council to see if they could arrange more visits to works, as this would be an advantage to the members.

The resolution was then carried unanimously.

Gas Examinations.

The President said he had to mention a matter which had been brought before the Council—namely, that the City and Guilds of London Institute should be approached with regard to examinations and classes in "Gas Distribution." At present, such classes were not given here, except with respect to particular branches—like fitting. He found, however, that in Ireland they had distribution classes; and he thought that now this department had become such an important part of the gas industry, it called for special classes. He could quite appreciate this himself, because in the 21 or 25 lectures which were given to a class, if one had to go right through both manufacture and distribution, either one subject or the other had to be scamped. Both were important; and it was very necessary instruction should be given in them. Hitherto distribution had been more or less glanced at, and manufacture had been given the preference.

Mr. Darrah inquired whether the Council had taken any steps in the matter.

The President replied that at present they could not do so, because it had been agreed that the other Junior Associations should be approached with regard to their own districts. The matter had been much discussed.

Mr. R. J. Rogers (Birmingham) remarked that he was pleased the matter had now come before the Association. When he mentioned it in his paper a short time previously, he felt that there was really great scope for classes in distribution; and he could quite appreciate what the President said with reference to the lectures. If one session had to include manufacture and distribution, it was impossible to go properly through both. There were plenty of branches allied to distribution; and he was sure it could easily be made a subject for examination.

The Hon. Secretary said he thought the proposal to have a separation of the subjects was very good; but it seemed to him that division under the two heads of manufacture and distribution was not sufficient. There should at least be four divisions. For instance, they might have manufacture, construction, distribution, and the commercial part. Each was quite as important as the others. There might be one examination, with a division of subjects, so that a candidate need not pass in all; but his certificate would state which divisions he had passed in. He moved that the Council should be empowered to communicate with the other Junior Associations and the Midland Association of Gas Managers, with a view to approaching the City and Guilds of London Institute with reference to the sub-division of the subject of "Gas Manufacture."

Mr. F. J. Bywater, in seconding, remarked that the City and Guilds examinations simply resolved themselves into writing matches; and if some such project as Mr. Hewett had suggested were laid before the authorities, it might lead to good results. It was absolutely impossible to answer all the questions in the time at disposal; and it would be a great advantage to divide the examination into parts, and make it optional for a man to take up which branch or branches he preferred.

The proposition was unanimously agreed to.

Election of Officers.

The following officers were then elected for next session :—

President: Mr. W. E. Caton (Derby). *Vice-Presidents:* Mr. S. T. Smith (Walsall) and Mr. James Hewett (Saltley). *Hon. Secretary and Treasurer:* Mr. J. Hewett (Saltley). *New Members of Council:* Mr. A. N. Comely (Windsor Street) and Mr. R. J. Meiklejohn (Rugby). *Hon. Auditor:* Mr. J. H. Hardy (Coventry).

Mr. Caton briefly returned thanks for his election as President, and said he hoped the members would help him to make the ensuing session an even greater success than the two preceding ones—more especially with regard to the numbers attending the meetings.

Gas-Works Statistics.

Mr. W. Wastell (Birmingham) afterwards read his paper on "Gas-Works Statistics," which will be found (together with a report of the discussion) on p. 621.

ACETYLENE ASSOCIATION.

Sixth Annual Meeting.

The Sixth Annual General Meeting of the Acetylene Association was held last Tuesday, at the Bloomsbury Hall, Hart Street, W.C., under the presidency of Mr. Charles Bingham.

The first business consisted of the adoption of the accounts; and after this had been transacted, the members settled down to listen to a short

Address by the President.

In the course of this, he expressed his thanks and appreciation to the Past-President, Sir Charles Stewart Forbes, for his services to the Association during the past three years. He also thought they should record their thanks to Mr. Leigh Bennett, the former Vice-President, who for the greater part of the year was very assiduous in attending to the business of the Executive. To his co-Vice-President, Mr. F. L. Rawson, the industry and the Association were specially indebted for much valuable and gratuitous service, particularly in connection with the compilation under his editorship of a pamphlet dealing with acetylene from a popular point of view. The Council had accorded to Mr. Rawson the only recognition which it was in their power to make, by electing him an honorary member of the Association.

He said it was satisfactory to see that acetylene was not only sharing in the general trade prosperity, but had advanced much more rapidly than could have been fairly anticipated. Indeed, progress had only been checked by the unfortunate scarcity of carbide. Whereas the quantity imported in 1905 was nearly twice as much as in 1904, the figure for 1906 was almost exactly the same as that for the preceding year. The result of this was that they heard on all sides of installations being shut down. This famine would be a serious menace to the future of the industry, were it not for the fact that the consumption had grown more rapidly than had been anticipated. A great increase in the supply of carbide would, however, be secured during the present year; and, in fact, there seemed to be some probability of a large carbide factory being erected in this country. He calculated that if the entire quantity of electricity sold in this country by municipalities and private undertakings had been devoted to the manufacture of carbide, it would have fallen far short of the electric energy required to produce carbide in Europe last year. The quantity of electricity sold in this country for all purposes amounted to 522,886,229 units; while the carbide manufactured was 122,300 tons, to make which, it might be taken, required 758,260,000 units, or about 50 per cent. more than the entire sale of electricity in this country. It was not only for lighting that the acetylene and carbide of calcium industries were making progress; and among the other purposes, a very important one was the rapid development of the oxy-acetylene blow-pipe. In the replacement of petroleum flare-lights, acetylene was making great progress; while the use of dissolved acetylene was also going ahead for various purposes.

Passing on to the affairs of the Association, he said that a splendid testimonial to the practical non-inflammability of carbide was contained in an official report of the Fire Department of the Board of Public Safety at Chattanooga. A reprint of this report, with further necessary particulars, was forwarded to all the Fire Insurance Companies in the United Kingdom. That it was in many cases carefully digested by them, had been evidenced by inquiries the Association had received from branch fire offices all over the country. They thought they had now pretty well established their claim to be superior, from a fire insurance point of view, to any other system of illumination whatsoever. In former years there were complaints from time to time, when new installations were put down, and difficulty with regard to fire insurance; but, as far as last year was concerned, they appeared to have received no complaints whatever. They might take it, therefore, that the Insurance Offices were now only too glad to have acetylene substituted for candles, oil, coal gas, or even electricity. That this feeling of mutual confidence might continue and increase, a representative of the Fire Offices had been invited to join the Council. With regard to the Press, though there was still some cause of complaint at the readiness with which some papers ascribed bad qualities to acetylene, the cases brought to the notice of the Council during the past year, in which it had been necessary to remonstrate, had been distinctly fewer than in former years.

After some remarks on the carriage of carbide to India; the President referred to a recommendation to members that, in purchasing carbide for abroad, it should be stipulated that the purchases were made under the regulations of the Association, and not under those of the country of origin. Personally, he was prepared to make the recommendation earlier; but some members of the Council thought the time inopportune in view of the then existing scarcity in the supply of carbide. Should purchases abroad be made under foreign conditions, it might be laid down as an axiom that it was impossible for the buyer to claim for inferior quality of the carbide. Of course, the recommendation was merely a hint; they could not bind anybody. Another matter which he proposed was the addition of a regulation limiting the quantity of phosphorus compounds permissible in commercial carbide. The resolution was to the effect that "carbide which, when properly decomposed, yields acetylene containing, from all phosphorus compounds therein, more than 0·05 per cent. by volume

of phosphuretted hydrogen, may be refused by the buyer." He pointed out that the German Association had adopted a similar resolution, but with a limit of 0·04 instead of 0·05 per cent.

Articles of Association.—Papers Read.

Subsequently votes of thanks were passed to the honorary officers—Messrs. Batten, Proffitt, and Scott, Solicitors, and Messrs. Fitzpatrick, Graham, and Co., Auditors; and alterations were agreed to (subject to confirmation) in the Articles of Association, so as to permit of the holding of the meeting at a more genial season of the year than at present, and also with a view to promoting a healthy rota in the appointment of officers of the Council.

This portion of the business was followed by the reading of the following papers: "Acetylene Burners," by Mr. Arthur Bray (of Messrs. George Bray and Co., Limited); "Cost of Acetylene Lighting," by Mr. F. S. Thorn; "Dissolved Acetylene" (with demonstration), by Mr. J. B. Baker; "Oxy-Acetylene Welding" (with demonstration), by Mr. Charles Hoddle. In addition to this, M. Hublin (who had come over from Paris specially for the purpose) explained, and in a yard attached to the building gave an excellent practical demonstration of, a system of cutting steel and other metals by a twin-jet oxy-acetylene blow-pipe.

Acetylene Burners.

Mr. Arthur Bray's paper on "Acetylene Burners" was the first one taken; and this, in the absence of the author, was read by the Secretary (Mr. Lacey Downes). In it, the author said that the invention of the air-injecting acetylene burner marked an epoch in the history of lighting by acetylene; but though it eliminated some of the troubles previously experienced, it brought others in its train. The first of these burners was mounted in a horse-shoe shaped metal socket; but though this kind had a longer life than the union-jet flat-flame burners, in the end they all suffered the same fate and began to carbonize. Another complaint was that, by the continual heating and cooling of the burner, the metal arms of the socket warped, and threw the jets of flame out of alignment. The third complaint was that people (having been accustomed to the use of coal gas) would insist on turning the flames down, when the full light was not required, with the result that the tips became covered with a deposit of carbon.

In 1898, Mr. John W. Bray, the present Chairman of Messrs. George Bray and Co., feeling that the inability of the users of acetylene to turn the flame of their burners down to a small jet was a great drawback, applied himself to the problem of making a "turn-down" burner; and he experimented with the object of mixing more air with the gas, until he became convinced that the only way to prevent the deposit of carbon on the vital parts of the tips when the flame was turned low was to lift, by some means or other, the small jets of flame away from these vital parts. The result was a patent which consisted in placing an open superstructure above the burner-tip proper. When the flame was turned on full, the superstructure was not in action; but when the burner was turned down to a small jet, the luminous flame was expanded by the superstructure, thus allowing the surrounding atmosphere to come in contact and combine with a larger area of the flame, which rendered it practically non-luminous—more especially that part of the flame which came in contact with the vital parts of the burner-tip proper—and so prevented the deposit of carbon. This patented burner was called the "Elta," and he claimed that it was the only air-injecting burner in existence (excepting only its "licensed relatives") which could be turned low, like coal-gas burners, without detriment.

Dealing with the question of carbonization, the author contended that the main cause of air-injecting burners carbonizing was some obstruction at the point where the gas entered the minute gas-passage—that was to say, the underneath side of the tip. This obstruction checked the speed of the gas-jet, and prevented it taking a sufficient quantity of air into the mixing-tube, so that there was improper combustion, and consequently carbonization. The obstruction was sometimes caused by particles of metal left by a careless plumber after tapping out the gas-bracket, and at others by particles of dust in the pipes being carried along by the gas. But generally the obstruction arose from impurities in the gas, caused sometimes by faulty generation. The author and his late father and brother were greatly troubled during some experiments by burners becoming blocked; and they found, when disconnecting a sharp elbow in the fittings, a considerable quantity of flaky white crystals, which were also discovered in other sharp bends of the installation. The substance scraped off the burner-tips and these white crystals were then analyzed; and to their astonishment, they found the substance in each case was ammonium chloride, which had also been discovered on other installations since this time.

The author concluded with some remarks on the question of the warping of metal-armed burners. He said that in nearly ten years' experience, he had not come across a single case where a metal-armed burner had warped by the action of the heat of the flame, as some people alleged. There had been persons who had written saying the burners had warped; but they had always been told to use a cleaning needle, and clear out the small gas-holes in the burner, and, if the burner still warped, to return it to the firm. In no case, however, had a single warped burner been returned.

The President asked Mr. Gatehouse (who is the Association's Analytical Chemist) whether he had ever in his tests come across crystals of ammonium chloride.

Mr. J. W. Gatehouse said he had never had an opportunity of finding ammonium chloride; but he knew that a compound which ordinarily would be analyzed and called ammonia was found in the fittings. He was, however, convinced that it was not NH_3, but a much more complicated substance. It was only found from the most impure forms of carbide. Any carbide which would ordinarily give 4·8 cubic feet to the pound would not generate anything worth mentioning of this impurity. But in any event, if they passed the gas through dilute sulphuric acid, they would not be troubled with it. He had some metal-armed burners, in brass, which warped dreadfully; but they were not Bray's. Reverting to the question of ammonia, a son of his in Belfast had recently sent him some residue from a carbide generator which might be of interest to the members. It was most remarkable; and he found it contained 3·28 per cent. of nitrogen. This had, of course, no business to be in carbide, though it was valuable as a manure. There were some samples of carbide which produced large quantities of a compound which they were not sure was really ammonia, though they converted it into ammonia in the course of analysis.

Cost of Acetylene Lighting.

Mr. F. S. Thorn, in his paper on the "Actual Cost of Acetylene House Lighting," argued that to take photometric tests of different illuminants, with the cost of raw material, was absolutely misleading, as there were so many factors which influenced the actual light obtained from incandescent gas, electricity, &c., that no isolated scientific tests could fairly be taken as a basis. The initial cost of an acetylene installation was, to put it mildly, very much less than for any other independent illuminant calculated to satisfy present-day requirements. He went further, and maintained that even where lighting from an outside source was available, it would well repay the public to use acetylene, because of the great hygienic advantages it had been proved to possess. Other expenses in addition to calcium carbide were practically negligible—say, man's time, 1 hour per day per 100 lights, and purifying £2 per annum per 100 lights.

He took the present price to consumers of calcium carbide at 16s. per cwt., which allowed a reasonable amount for carriage; and then proceeded to cite a few instances of the actual amount consumed for a given number of lights in different installations. The figures varied, of course, owing to the lights not in all cases being kept burning for the same length of time; but the author, from the figures quoted, worked the average quarterly expense out as follows: 20 lights, £2 8s.; 30, £4 10s.; 40, £5; 50, £6; 60, £8 10s.; 70, £9 10s.; 85, £12 10s.; 100, £13. He thought these amounts would compare very favourably with the quarterly bills that would have to be paid to electricity or gas companies, or even with those received from oil merchants But even if the carbide consumed cost more than coal gas or paraffin, the user of the former would find that his walls and ceilings did not have to be re-decorated nearly so often. He did not mention gasoline or petrol, because he considered that the former was entirely superseded by acetylene, while the latter had yet to prove itself satisfactory as a house-lighting agent.

His conclusion was that those connected with the acetylene industry might fairly congratulate themselves on the fact that they could compete in price with any other modern illuminant.

Dissolved Acetylene.

Mr. J. B. Baker, who dealt with the subject of "Dissolved Acetylene," referred to the danger of handling liquefied acetylene, which led to its use being forbidden in the United Kingdom and some other countries. It was, however, he said, felt that, for certain special purposes, it would be an immense benefit if by some means acetylene could be brought into such a condition as to be portable in fairly large quantities, even if not in so highly concentrated a form as liquid acetylene. Ultimately advantage was taken of the fact that acetone had the power of dissolving acetylene, just as water would dissolve ammonia or hydrochloric acid gas. It was shown that acetone would dissolve about 25 times its own bulk of acetylene at ordinary atmospheric pressure, and that for each additional atmosphere of pressure to which it was subjected, a similar quantity would be dissolved. At length, with the aid of acetone and a porous substance known as "charcoal cement," acetylene had been so dissolved as to be rendered inexplosive; and the Home Office thereupon exempted it from the prohibition placed on liquefied acetylene.

After describing the process, the author drew attention to the purposes for which dissolved acetylene was useful. For ordinary house lighting, he said, it was out of the question, on account of cost; but where portability was a point, or where daily attention could not be given, things were different. For motor vehicles dissolved acetylene was excellent; and it was also being adopted for light-buoys and lighthouses in places not easy of access. There were innumerable cases in which its use was the only possible way of performing the autogenous welding of metals; and it was also valuable for projecting purposes.

Subsequently Mr. Baker showed in operation a "flasher" for lighthouse and other purposes, which could be set to give a flash of any desired duration at any required intervals.

Oxy-Acetylene Welding.

Mr. Charles Hoddle read the last paper, which was on "Oxy-Acetylene Welding." He said many people were surprised to

hear that it was possible to weld or melt metals by means of acetylene; but though a cool light, it was very hot as a flame. When first acetylene welding was introduced, it was thought to be only possible by using both the gases under pressure; but he believed that now the "low-pressure" system—acetylene from an ordinary generator, and oxygen only under pressure—would get most of the work, because of its convenience and economy. As to acetylene welding generally, he thought that when its possibilities were properly understood by the engineering world, an installation would be regarded as almost as essential to a workshop as a lathe or drilling-machine.

After concluding his paper, Mr. Hoddle gave the members some illustrations of how acetylene welding is carried out.

The proceedings terminated with votes of thanks to the readers of the papers, to M. Hublin for his interesting demonstration, and to the President for his services.

GAS-WORKS STATISTICS.

By W. Wastell, of Birmingham.

[Digest of a Paper read before the Midland Junior Gas Association.]

It is evident that to make and distribute gas with any degree of success in these days of keen competition, is no simple matter; and it is necessary for the gas manager to bring to his aid plant and appliances which will yield the best and most economical results in manufacture, purification, and distribution. Given this plant, the next important step is to ascertain whether it is working to the best advantage; where profit is being made or loss sustained; where economies may be effected or extravagances checked; and how to stop leakages of all kinds. To this end, there should be kept in connection with every gas undertaking of any magnitude, a set of statistical records, deliberately and thoughtfully contrived, carefully examined, and arranged to suit the special needs of the individual concern to which they refer. In constructional matters the importance of strict accuracy in every detail is recognized and insisted upon; but I fear that the importance of accurate and comprehensive records of working results, and the use of definite data, is not fully realized, and time and money are begrudgingly spent upon the preparation of such returns, which parsimony cannot but be detrimental to the interests of all concerned. In our early school days, two and two always made four, or we had to suffer for it; but we do not require a very long experience in dealing with statistics to realize the sad fact that two and two sometimes make three and sometimes five.

What we should attempt to achieve is the collation of carefully dissected results, set out tersely in tables or shown by means of diagrams, which shall indicate in no ambiguous terms the efficiency or otherwise of each separate process of manufacture. Such returns, I grant, can only be the outcome of much labour and thought; and the task of preparing them should be allocated to men possessing special aptitude and training in the work. But I am convinced that any time and trouble bestowed on the preparation of returns that shall indicate true working results week by week and year by year, will be repaid tenfold. We often hear it said that dividends are made or lost in the retort-house; but that is only an adage, and not an axiom, for it is only partly true. If you accept the saying as true, and devote too much time to the perfecting of the operations within the retort-house, to the partial neglect of the remainder of the plant, your dividends are in jeopardy; for your retort-house plant may be perfect both in design and construction, and the results obtained therein may leave nothing to be desired; but if your leakage is high, the wants of your consumers treated with indifference, and your residuals wastefully disposed of, what then? You must be satisfied that you are getting the most out of everything connected with your undertaking; and I contend that you will be a long way towards that goal if your statistics are prepared in such a form that the weak points in your working are brought into prominence.

For the furtherance of this end, a standard of excellence is required—a datum-line below which your results should not fall. Let us see what material we have ready at hand for the formation of such a standard. The three principal annual compilations of statistics relating to the gas undertakings in the United Kingdom and Ireland at present published are: (1) The Board of Trade returns relating to all authorized gas undertakings in the United Kingdom. (2) Field's analysis of the accounts of the principal undertakings in England, Scotland, and Ireland. (3) The "Gas World" analysis of accounts of gas undertakings.

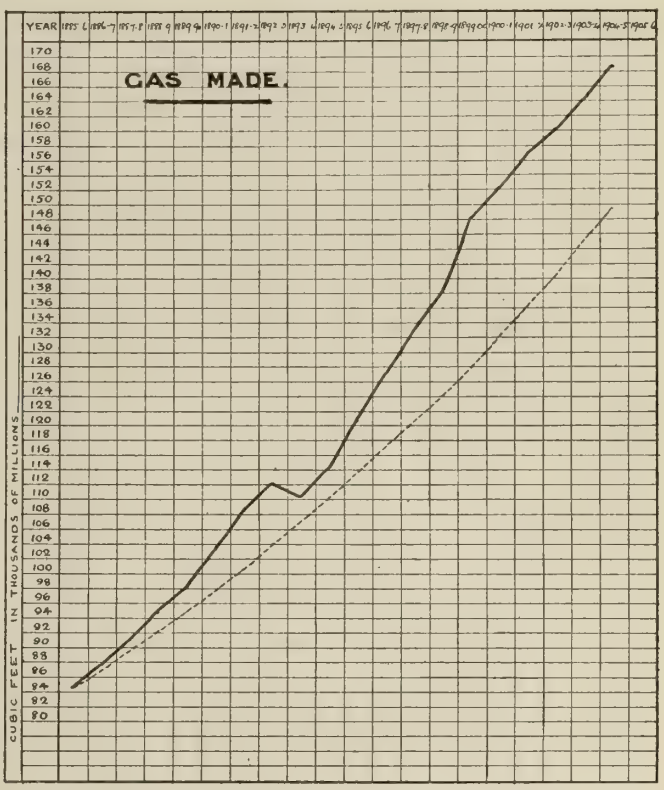
Of these, the first-named embraces all the authorized gas undertakings belonging to both companies and local authorities in the United Kingdom and Ireland; and it contains a mass of information which, however, falls tantalizingly short of much that is of interest and assistance to the gas manager. The second (an old and trusted friend) has become, I suppose, a standard work of reference, and deals pretty thoroughly with the inner working of a few selected gas undertakings. The last-mentioned (an infant three or four years of age) bids fair to firmly establish itself as its older contemporary has done; and it has already been extended to a digest of the working results of one hundred of the largest gas undertakings in the country.

From the Parliamentary Returns we are able to glean the following information, which indicates the steady growth in the use of gas during the past twenty years:—

Year.	Number of Undertakings.	Number of Tons of Coal Carbonized.	Number of Cubic Feet of Gas Made. Thousands.	Miles of Gas Mains.	Number of Consumers.
1886–7 .	539	8,657,731	87,931,537	19,443	2,130,377
1887–8 .	552	8,962,831	91,371,514	20,112	2,163,258
1888–9 .	568	9,255,570	94,709,667	21,123	2,192,946
1889–90 .	578	9,663,011	98,081,286	21,584	2,244,105
1890–1 .	594	10,242,367	103,011,039	21,969	2,297,278
1891–2 .	604	11,219,292	108,694,259	22,377	2,323,037
1892–3 .	614	11,096,480	112,481,278	22,674	2,416,896
1893–4 .	620	11,020,292	110,781,788	22,826	2,451,585
1894–5 .	627	11,329,301	114,295,680	23,310	2,524,217
1895–6 .	632	11,937,446	121,422,752	23,857	2,659,771
1896–7 .	641	12,296,739	127,041,603	24,457	2,845,728
1897–8 .	648	12,616,153	132,692,725	25,157	3,035,376
1898–9 .	661	12,841,817	138,246,995 (a)	25,481	3,249,138
1899–00 .	682	13,610,688	148,155,557 (a)	26,807	3,485,557
1900–1 .	693	13,906,288	152,007,811 (a)	27,591	3,713,289
1901–2 .	705	14,102,629	156,686,892 (a)	28,285	3,920,992
1902–3 .	710	14,109,219	160,578,787 (a)	29,144	4,168,725
1903–4 .	719	14,201,836	164,207,843 (a)	30,026	4,431,125
1904–5 .	734	14,295,602	168,647,676 (a)	30,890	4,737,177
1905–6 .	752	14,480,325	174,904,791 (a)	30,931	5,064,075

(a) Including water gas.

A glance at the figures given is sufficient to satisfy you that there is no evidence of a decadent tendency in gas production; and they demonstrate very clearly the magnitude of the industry, with which one may pardonably be proud to be associated. In the past twenty years, the quantity of gas made by the authorized undertakings in one year has been doubled, and the increased make year by year is indicated graphically by the diagram, in which the firm black line represents the make of gas each year since 1885-6, and the dotted line the make for that year increased by 3 per cent. compound per annum.



A gasholder half a mile in diameter and 32,000 feet high would be required to contain all the gas made during the year 1905-6 in the British Isles by the 752 undertakings included in the returns, and it would take thirty years at least to empty the holder through a 24-inch outlet at 2 inches pressure. If the coal carbonized in that year were loaded into 10-ton trucks, it would require six sets of sidings reaching from London to Edinburgh to accommodate them; while the gas-mains at present laid in this country would girdle the earth at the Equator, and still leave sufficient to reach from the Equator to the North Pole. Unfortunately, all the gas made is not sold, and the quantity unaccounted for in twelve months (taking the moderate estimate of 5 per cent.) would supply the whole of the Birmingham gas area for slightly more than a year. It is interesting also to note that the twelve largest undertakings, or 1·6 per cent. of the total number included in the returns, made slightly over 42 per cent. of the total gas produced. But this is a little digression.

Now each of the compilations I have mentioned has its own peculiarities; and when you begin to tackle them in real earnest, and endeavour to press them into the service of your own particular branch of work, you are beset by a host of difficulties. The return from Westminster is too dignified to descend to such

trivialities as the number of cubic feet of gas produced per ton of coal carbonized; and this cannot be in consequence of its strict regard for veracity, for the total number of tons of coal carbonized and the quantity of coal gas made are both stated, as is also the illuminating power of the gas supplied, which is given without a query mark in a single instance. Neither does it show the quantity and value of the residuals produced and disposed of, which, I think you will agree, is not a small factor in the successful working of a gas undertaking.

In "Field's Analysis," we have the working results of the London and Suburban gas companies, and of eleven municipal undertakings and nine companies in the Provinces, set out most comprehensively in a handy form, carefully arranged, and easy to follow. Its value for reference would, however, be vastly enhanced if the coal-gas and the carburetted water-gas results were shown and worked out separately; for I have a very shrewd suspicion that some of the figures given in the "per ton of coal" column are arrived at by dividing the tons of coal carbonized into quantities or sums which are made up of both coal and carburetted water-gas results. Again, as regards Birmingham, the tons of coke quoted as being made for sale do not include about 60,000 tons of breeze sold, though the income from coke contains the value of this breeze; and this would appear to be the case also as regards other of the undertakings in the analysis, as in some instances a footnote states that breeze is included in the figures given. In the "per 1000 cubic feet sold" column, the results are worked out on the gas sold to private consumers, excluding the quantity used on works; but seeing that in some instances at least, the cost of this latter quantity forms a charge against manufacture, and is included in the revenue account, I think that the total quantity of gas sold and used on works should be adopted as the divisor for obtaining the detailed results.

Similarly, the "Gas World Analysis" arrives at some of its fundamental figures by calculation; and the remarks as to the separation of the results from coal-gas and carburetted water-gas plants apply equally to this return. Thus, for those undertakings manufacturing water gas, is shown the number of tons of coal carbonized and coal equivalent of other materials; the formula used to arrive at the additional number of tons of coal that would have been required had carburetted water gas not been made being "as coal gas is to water gas so is coal to the equivalent." This proportion is no doubt a fair and accurate one; but, after all, it is a theoretical, and not an actual, quantity that is used in arriving at the results per ton of coal carbonized.

The following table shows side by side some of the results given in "Field's Analysis" and the "Gas World Analysis," for the same undertaking, and, of course, for the same year. The differences are perplexing:—

—	"Field's Analysis."	"Gas World Analysis."
Tons of coal carbonized	504,664	632,207*
Thousand cubic feet of gas sold	6,192,354	6,293,810
	Per Ton of Coal.	Per Ton of Coal.
Coke and breeze saleable	7·80 cwt.	9·9 cwt.
Tar made	10·8 gals.	12·0 gals.
Ammoniacal liquor made	34·4 ,,	34·3 ,,
Receipts from residuals—	Per 1000 Ft. Sold.	Per 1000 Ft. Sold.
Coke	4·34d.	4·27d.
Tar	1·37	1·35
Liquor	1·93	1·90
Total revenue	33·76	33·27
Manufacturing charges—		
Wages	2·71	2·66
Wear and tear	6·43	6·34

* Coal and coal equivalent.

Now I hope that I shall not be accused of carping criticism. It would be presumptuous on my part were I to attempt to underrate the value of either book of analyses referred to. They are both indispensable; and "Field" has been welcomed each year for a long time as a guide, philosopher, and friend by hundreds of gas managers throughout the country. The time, thought, and care expended in their preparation entitle the compilers to the gratitude of those responsible for the management and control of the gas industry; but what I wish to emphasize is the fact that, no matter how much time, trouble, and experience are brought to bear upon a task of this character, it is difficult, even with the same primary figures to start with, to arrive at concordant results.

This brings me to the kernel of my paper, which is that if statistics are to be of real service in a gas undertaking, they must be prepared to meet the special needs of each individual concern; and to point this argument, I ask you to look at the following figures, from the "Gas World Analysis" for 1904-5:—

	A. Highest.	B. Lowest.
1.—Gas made per ton	12,272	7909 cubic feet.
2.—Illuminating power supplied	24·20	14·00 candles.
3.—Gas accounted for	98·40	83·40 per cent. of make.
4.—Net cost into holders.	22·57	5·17d. per 1000 cubic feet.
5.—Total revenue	63·25	27·67d. ,, ,, ,,
6.—Total expenditure	42·67	20·28d. ,, ,, ,,

I have just run down the columns and extracted the highest and lowest results quoted under these six heads; the undertakings being different in each case. Now, of what interest is it to one manager to know that for every 2 tons of coal he carbonizes another less fortunate individual has to carbonize 3 tons so as to produce a like quantity of gas? Would it be possible, supposing A and B exchanged places, for A to produce the same results at the works of B? Would he be able to increase the yield per ton by 4000 cubic feet, raise the illuminating power 10 candles, reduce the leakage 10 per cent., and save nearly 1s. 6d. on the cost of each 1000 cubic feet of gas put into his holders? Perhaps not. There are many local factors influencing working results and costs to be taken into account when comparing the figures of different undertakings; but the published returns are a valuable indication of the possibilities in gas manufacture.

A careful inspection and digestion of these returns will enable the responsible person to perceive the more important discrepancies between his own results and those generally obtained; and the question to ask himself would be: "If these results can be obtained in other works, why not in mine?" By overhauling, improving, and reconstructing his plant, by concentrating his attention for a brief period on each item in turn, he would ultimately form a standard of working for his own plant under local conditions. Then, so long as his returns did not depreciate, no matter what results his *confrères* were obtaining elsewhere, he could be satisfied that, so far as his own works were concerned, he had reached a standard of practical perfection.

I think you will all agree that, to be effective, returns should be prepared in the simplest manner possible. A few figures indicating the leading items in both expenditure and income are of more use than masses of detail. Figures beyond the first decimal place are rarely of any consequence, because of the unavoidable fluctuations in manufacture; and it is only the avoidable fluctuations which demand attention. Anything beyond this only tends to confuse the eye and bewilder the mind.

For real utility, I would commend a loose leaf book, to contain on each page results under one particular heading extending over a series of years. Such a book would prove invaluable for reference and of real assistance in assessing the value of a year's working. One page, for instance, would be devoted to "Coal," and the information arranged (say) as follows:—

Year ending March 31.	Coal Carbonized.					Average Price paid per Ton of Coal d/d at Works.		Cost of Handling per Ton.	Total Cost per Ton.		Remarks.
	Common.		Cannel.		Total.						
	Tons.	Per cent	Tons.	Per cent.	Tons.	s.	d.	d.	s.	d.	

Another page "Gas," another "Residuals," and so on; the remarks column being freely used to explain the cause of any exceptional fluctuation one way or the other.

Of the use of different coloured inks to emphasize leading figures, and of the preparation of statements and diagrams on tracing paper so that they may be superimposed for easy comparison one year with another, I can probably teach you nothing; but I should just like to mention the usefulness of logarithms where statistical work assumes important dimensions. Those unacquainted with them will be surprised at the ease with which they may be mastered. The slide rule, too, supplies us with an invaluable aid to the almost instantaneous working out of results, both simple and complicated.

In this paper I have only touched the fringe of the subject; but I do seriously suggest to you that it is a matter demanding earnest consideration.

Discussion.

The President pointed out that they had with them that afternoon their recently elected honorary member, Mr. Hubert Pooley, the President of the Midland Association. They were always pleased to see among them members of the Senior Association; and it was gratifying to find that, ever since the start, these gentlemen had shown practical interest in the Junior Association by attending the meetings and taking part in the discussions. He invited Mr. Pooley to open the discussion on the paper now before them.

Mr. Hubert Pooley (Stafford) said it afforded him the very greatest pleasure to be with them that afternoon, and particularly to listen to Mr. Wastell's paper. Statistics had been a hobby of his (the speaker's) all his gas life—as he hoped they would be of the members of the Association. By their use, they were enabled day by day, week by week, month by month, and year by year, to follow out their working with the utmost care, to touch weak spots, and to remedy faults where they might occur. This was a matter that he had dealt with considerably in his recent address to the Senior Association. He was really sorry that he had done so when he learnt from the Hon. Secretary that he would be listening to a paper on statistics that afternoon. Mr. Wastell referred to the old adage about dividends being made or lost in the retort-house; but perhaps it would be truer if they were to say that there was more wastage possible in the retort-house than anywhere else. In criticizing slightly some of the figures given by the author, he should like to say that he believed the unaccounted-for gas as shown in the Board of Trade returns was more nearly equal to 8 or 10 per cent. than to the 5 per cent. which was stated in the paper to be a moderate estimate. He thought himself that this 8 or 10 per cent. loss was

very little short of a disgrace to their profession. He had long been fighting with unaccounted-for gas. In the first gas-works over which he had charge, he was successful in reducing it from 17½ per cent. to approximately 6 per cent. in seven years. In his present works, he had reduced the unaccounted-for gas from 5 per cent. to 2 per cent. He thought if they could approximate from 2 to 3 per cent. they would have reached almost ideal conditions; and personally, if he could maintain his 2 per cent., or anything approaching it, he would be perfectly satisfied. He was exceedingly glad to have the opportunity of correcting the statements that had been made regarding his own works on the question of the relation between coal gas and carburetted water gas as arrived at statistically. They showed—and he thought that the "Gas World" would show—that they manufactured last year rather over 11,824 cubic feet per ton of coal, and sold 11,443 cubic feet. The method by which he arrived at this figure was by deducting the total carburetted water gas made, as shown on the water-gas meter, from the total gas produced as indicated on the station meter. Then taking the quantity of coal actually used, he arrived first of all at the make of coal gas per ton of coal. From this it was quite simple to get the equivalent in coke and oil. The author of the paper rather contradicted himself when he said he had "a very shrewd suspicion that some of the figures given in the 'per ton of coal' column were arrived at by dividing the tons of coal carbonized into quantities or sums which were made up of both coal and carburetted water gas results;" and a little later on—in the following paragraph—he gave almost exactly what he (the speaker) meant to state, adding that the proportion arrived at by this method was "no doubt a fair and accurate one." With reference to the question of coke and breeze, he had always in connection with works over which he had had charge taken the total quantity of coke and breeze as being the tonnage; and, of course, the total receipts from both gave the average price for the coke. That was to say, he included the breeze with the coke, which made the price for coke rather low. His average price last year was 9s. 8d. per ton. He was rather surprised in calculating out the percentage of breeze at Birmingham from the author's figures. He (Mr. Pooley) made it out to be about 20 per cent. of the total coke; and if this was so, he thought it rather heavy. Taking the quantity of coal carbonized at 600,000 tons per annum, the 60,000 tons of breeze would be roughly 20 per cent. of the coke sold. With regard to the question of gas used on works, he thought perhaps the author would agree with him that this constituted part of the manufacturing charges; and if so, why should the figure be taken into account in arriving at the cost per 1000 cubic feet sold? In his own early days, he was exceedingly fond of "Field's Analysis," which was certainly recognized as the standard in those times. But he felt—and had always felt—that it was not sufficiently inclusive. It only embraced about 36 gas-works now, and in his early days the number was not more than 15; so that the statistics given, at any rate for those in smaller works, were almost valueless. Then with regard to the third table in the paper, he had had charge of gas-works in both England and Scotland; and he had heard Scotch engineers rather twit those in the South on the quantity of gas they were able to produce per mouthpiece. He had not the least doubt that the lowest figure per ton given in this table would be for a Scotch works, and the highest for an English works; but at the same time he felt convinced that the former was able to produce more per mouthpiece than the other. When he told them that he regularly carbonized in Scotland with three-hour charges, this would be easily understood. He rarely obtained more than 9500 cubic feet per ton. He was using Fife coal; and probably better coal did not exist in Scotland of the softer sorts. He thought at Coatbridge—he was speaking from memory—the make was not more than 8300 or 8400 cubic feet per ton; yet Coatbridge was a works which obtained results second to none, he thought, in Scotland, and it pushed many in the South very hard. In conclusion, he said he had with him at the meeting a sample of the "Cerofirm" mantle, which he had had brought over from Berlin for him.

Mr. Enoch Evans (Birmingham) said that proficiency in the use of the slide-rule would enable members to become better acquainted with statistics relating to their own and to other works than was likely otherwise to be the case, because he presumed that most of them were fully employed, and that it was not a keen delight to labour at figures more than was necessary. In the slide-rule, they had at their hand an appliance which enabled them to do more in the way of analysis of figures than could be performed by any other means. In the matter of calculations for practical purposes, it was unrivalled. If they wanted to convert one set of statistics couched in one set of terms into those of another set of terms—for instance, the French grammes per cubic metre into grains per cubic foot—the slide-rule, with almost instantaneous setting, would give them the information. If they wished to know what was the comparative cost of the French carriage of 1000 kilogrammes per kilometre in centimes, when they knew the cost in pence per ton per English mile, the slide-rule would give it—not only for the particular item which, perhaps, they required, but for any other item. For statistics per 1000 cubic feet of gas made and sold, the slide-rule, with a little practice, would give within ½d. each side of 8s. 4d.—that was, ½ per cent. either way. This for all practical purposes was sufficient; and it was for the practical man that he strongly recommended use of the slide-rule. The appliance had further claims on all who were engaged in the conduct of any large gas-works, because it enabled them to carry out much more intricate calculations than those he had already mentioned. The strength of beams and all ordinary structural questions could be solved by it with sufficient accuracy for tenders to be made on them, because it was improbable that the inaccuracies which were inherent in the slide-rule would be greater than those in actual results. The readiness with which anyone might avail himself of the slide-rule was a very great incentive to looking into matters which otherwise might escape notice. The text-book which he would recommend to those interested in the subject was Pickford.

Mr. A. W. Smith (Saltley) said he was sure he was voicing the feelings of all the members when he expressed gratitude to Mr. Wastell for his paper. He commenced by saying: "It is evident that to make and distribute gas with any degree of success in these days of keen competition, is no simple matter; and it is necessary for the gas manager to bring to his aid plant and appliances which will yield the best and most economical results in manufacture, purification, and distribution. Given this plant, the next important step is to ascertain whether it is working to the best advantage." He (Mr. Smith) thought a great many of those who were working plants for the design of which perhaps they were not responsible, would find this a very important hypothesis; and no amount of statistics would enable them to get over defects of plant. The study of statistics was, however, important to everyone engaged on a works, no matter what department he was connected with.

The Hon. Secretary (Mr. J. Hewett) remarked that there was not much to discuss, because the paper dealt mainly with facts. He quite agreed that statistics should be prepared (if at all) carefully; but they should be afterwards used carefully. Many statistics were prepared, but never utilized. In the first table in the paper, there was a very peculiar thing. In 1886-7, the average consumption per head was 41,000 feet; and in succeeding years this amount was considerably increased. The average had now, however, fallen to 34,500 feet per consumer. He should like to ask in how many towns the consumer of 34,500 feet got the benefit of the average price of gas. Some people favoured the big consumer, and others the small; but it seemed to him that between the two the middle consumer "fell in." For the purpose of his diagram, the author said he had shown the make of gas increased by 3 per cent. compound per annum. It was really 3½ per cent.; and he thought he ought to have shown a greater increase, though even then the diagram would still have been wrong. His line was based on an increased number of undertakings, whereas he should have taken the 539 undertakings existing in 1885-6. Because the number of authorized undertakings had increased, it did not follow that the additional ones were not in operation before. They were not necessarily new ones. Therefore he thought the method of showing the increase was not a fair one. The author's diagram was useful for showing a thing clearly; but it was still more useful for showing it in the manner one wished it to appear. With reference to the last table, he thought Mr. Wastell would agree that the 7909 cubic feet was Coatbridge; and if the make was multiplied by the candle power, there was not much difference between this and the 12,272 feet per ton works. As to the lowest percentage of make accounted for, he thought that in the instance given in the table they did not include the public lighting, because they charged so much per lamp and for the gas as well.

Mr. S. T. Smith (Walsall) thought there were one or two points that needed referring to. The author said "there should be kept in connection with every gas undertaking of any magnitude a set of statistical records, deliberately and thoughtfully contrived." He (Mr. Smith) was of opinion that all works, of whatever size, should keep these records. This would enable them to see what was going on, and where economies and alterations could be effected, and consequently the profits increased. Then, again, he said that the task of preparing the statistics should be allocated to men possessing special aptitude and training for the work. This might in some cases not be possible; but managers and others could get out figures for themselves, to see whether their results justified the expenditure. In another place, Mr. Wastell said, "You must be satisfied that you are getting the most out of everything." For his part, however, he would say, "Never be satisfied at all; always try to do better than you have done." As to statistics generally, he did not think they were of much use unless one was in a position to fully consider each individual case on its own merits, because there were advantages and disadvantages connected with every works, and unless they were known, it was impossible to properly compare one works with another. The distance from the coal-fields and the sale of coke and other residuals had to be considered; and then there was the vital point of capital expenditure. It was no use glancing down a column, and saying, "One works does this, and another that." He had read Mr. Pooley's Presidential Address; and he was very pleased to see he mentioned the Junior Association in a kindly way. He said he was satisfied with the progress of the Association, and had been much struck with some of the papers.

The President remarked that as the discussion had been a long one, he would content himself with proposing a very hearty vote of thanks to Mr. Wastell for his paper. Mr. Wastell had had a great deal to do with statistics in the compilation of gas-works records; and any ideas which he might give them must be valuable.

Mr. F. J. Bywater, in seconding, said he would have liked

Mr. Wastell to have shown them more what could be done than what ought to be done. Perhaps on some future occasion he would do this.

Mr. WASTELL then briefly replied to the discussion. He said he had no means of arriving at anything like a correct figure of leakage throughout the country, and was sorry to learn from Mr. Pooley that it was so high as 8 or 10 per cent. This doubled the deficiency. With regard to the "per ton of coal" column, they could not arrive at the figures as Mr. Pooley suggested, unless they knew the number of tons of coal carbonized. As to coke and breeze, the figure he gave for Birmingham was correct. With reference to the gas used on works, he did not see why it should not be looked on as a sale. The quantity of gas used on works at Birmingham was worth £10,000. They consumed 101 million cubic feet; and taking this at £100 a million, they arrived at about the figure he had given. This was an item. With regard to Mr. Hewett's remarks, a 3½ per cent. dotted line would not keep below the firm line all the time; and he wanted the firm line to be well above the other. In very small works, it might not pay to spend much time on carefully-prepared returns; and in all probability there would be no one on the works able to undertake the compilation of such statistics.

THERMAL EFFICIENCY IN INTERNAL COMBUSTION ENGINES.

At the Monthly Meeting of the Institution of Civil Engineers on Tuesday last, a paper on the above subject was read by Mr. DUGALD CLERK.

The author began by stating that the Institution Committee on the Standards of Efficiency of Internal-Combustion Engines were satisfied that the actual efficiency of good engines could be expressed by a ratio varying between 0·5 and 0·7. The Committee required, however, further knowledge as to the effect of the dimensions of the engine on the ratio; and accordingly they made tests on three engines having cylinders of 5, 9, and 14 inches diameter respectively, giving 6, 24, and 60 I.H.P. In these engines, taking the mechanical efficiency as 88 per cent., and calculating the I.H.P. from the B.H.P., they found that the efficiency ratios were 0·61, 0·65, and 0·69. The tests showed, therefore, that by bearing in mind the slight changes in the ratio due to difference in dimensions, a close approximation to the best indicated efficiency to be expected from a given compression could be obtained by the use of a factor varying between 0·6 and 0·7, according to the dimensions of the engine. The tests also showed very clearly the small increase in economy of large engines in comparison with small ones—there being only 12 per cent. increase between 6 and 60 H.P. The possible efficiency with the actual fluid used in the engine was known to be less than that given by the Committee's air standard. They considered that a definitely known standard, from which the actual efficiency could be deduced by using a multiplier found experimentally (allowing for the imperfections of the engine as well as for variations in the properties of the working fluid), should be adopted until the properties of the working fluid were accurately known. The author examined the results of test made by the Committee, and carried out some further experiments on the large engine used, with a view to finding the true heat-distribution in the engine.

The balance-sheet given by the Committee is as follows:—

	L.		R.		X.
Exhaust waste	35·3	..	40·0	..	39·5
Jacket waste	23·5	..	29·3	..	25·0
Radiation	7·6	..	10·0	..	7·3
B.H.P.	26·7	..	28·3	..	29·8
	93·1	..	107·6	..	101·6

In obtaining this balance-sheet, the exhaust waste was determined by the calorimeter, the jacket waste was measured, and the radiation includes friction of the working parts. Taking the mechanical efficiencies for the three engines as 0·84, 0·85, and 0·86, the friction percentage of the total heat is 5·1, 5, and 4·9 respectively. Deducting this from the jacket waste, corrected values for heat to the water-jacket of 21, 26·8, and 22·6 per cent. are obtained. Using these values, and reducing to percentage, assuming that the error in the total heat is not in the I.H.P. item, a new balance-sheet is obtained:—

	L.		R.		X.
Exhaust waste	41·1	..	37·1	..	39·9
Jacket waste True radiation	27·1	..	29·6	..	25·4
I.H.P.	31·8	..	33·3	..	34·7
	100·0		100·0		100·0

The ideal efficiencies in these engines are practically the same, and assuming that one-third of the heat going to the engine is converted to work, and that the heat loss occurs near the beginning of the stroke, the difference between the jacket *plus* radiation losses in any two engines should be three times the difference between the I.H.P.'s. In the L and X engines, this is found to be exactly the case. The jacket waste in the L engine is evidently too low, and on the above considerations should be 34·1. This value of the jacket waste for the L engine will give an exhaust waste of 34·1, which is practically the same as that determined by the calorimeter. It appears, therefore, that in the L engine some heat which should have appeared in the water-jacket has been lost. This corrected balance-sheet is probably more accurate than that obtained in the test; but there is still some heat found in the water-jacket which should be in the exhaust. The experiments give no means of determining this amount. The balance-sheet, however, gives a method of calculating the maximum possible efficiency of the actual fluid. Adding exhaust waste to I.H.P., and dividing I.H.P. by the sum, possible efficiencies for the three engines of 0·482, 0·473, and 0·465 are produced. In obtaining these values, however, it has been assumed that the heat is lost at the beginning of the stroke, and therefore the values are not accurate. If the distribution of the heat loss were known, the true adiabatic could be constructed and correct results obtained.

To check the results, indicator diagrams which give the correct mean pressure have been studied. From the composition of the exhaust gases and the charge temperature, the weight of the charge is found to be 0·14 lb. From the diagram, the temperature drop from the end of expansion to the charge temperature is 1745° Fahr. The specific heat of the gases by weight, assumed constant, is 0·185. From these values, obtained from the numbers given in the Committee's report, it appears that 43 per cent. of all the heat of the combustible gases is accounted for in the exhaust. This gives a balance-sheet for the X engine as follows:—

	Per Cent.
Exhaust waste	43·0
Jacket waste and radiation	22·3
I.H.P.	34·7

The exhaust waste here would obviously be greater if specific heat increases with the temperature. From this balance-sheet, calculated as before, an efficiency of 0·447 is obtained; with air, the efficiency would be 0·49. These considerations show the difficulty in using the actual fluid as a standard. In spite of the great labour expended on the experiments, only a rough approximation to the true heat distribution can be arrived at.

In 1884, the author made experiments on cooling after explosion in a closed vessel. Many other investigators have since done similar work; but the cooling of a cylinder having a moving piston had never been investigated. The author made further experiments, and determined the cooling in the X engine. It was run at normal speed, and when a charge had been drawn in the rollers actuating the inlet and exhaust valves were slipped, so that the valves remained shut. The explosion then took place, and the gases instead of being discharged were alternately compressed and expanded. From indicator cards the mean apparent specific heat of the gases in the cylinder has been deduced; the gases being practically the same composition as those in the Committee's trials. From the cooling curves and specific heat values a balance-sheet has been obtained for the X engine as follows:—

	Per Cent.
Heat flow during explosion and expansion	16·1
Heat contained in gases at the end of expansion	49·3
Indicated work	34·6

Comparing this with that found by the Committee, it is seen that the indicated work is the same in both. There is, however, less heat flow during expansion, and more heat in the gases at the exhaust. This shows that about 21 per cent. of the heat in the gases at the end of expansion goes to the water-jacket during the opening of the exhaust valve and the exhaust stroke. This is considered to be a more accurate balance-sheet than has yet been obtained. Calculating the ideal efficiency as before, the value 41 per cent. is obtained. From the values of specific heat given, the adiabatic may be calculated, from which the ideal efficiency is found to be 39·5 per cent.—showing that the actual engine has converted into indicated work 88 per cent. of the heat which it possibly could convert.

Tables have been calculated showing the ideal efficiencies for different compressions using the specific heat values given, and they roughly show that the air standard is 20 per cent. too high, and that the change of specific heat between 1700° and 1000° C. commonly used in practice is too small to produce much error. Until further knowledge is obtained, the air standard, as defined by the Committee, gives the best basis for comparing the performances of different engines.

The "Pall Mall Gazette," in their "City Notes" last Friday, said: The electric lighting position is exciting a good deal of interest; but it cannot be said that there is much to encourage investors. The warfare between gas and electricity has been waged with varying results; but at the moment gas has scored. There is, however, distinct hope that in the not distant future improvements and economies will be effected, and that there will be another swing of the pendulum. It may mean diminished receipts for a time, but it should mean a rapidly increasing consumption. This is the present hope of the electric lighting companies. The warfare with the great and powerful gas concerns has been keen, and the methods adopted by the latter for extending the incandescent lighting have probably not been of the soundest financially, though information is difficult to obtain. In one direction, the gas companies promise to have matters all their own way. The rapid development in gas heating and cooking is so much safe business. Electricity in these respects is, on any known invention, hopelessly out of it.

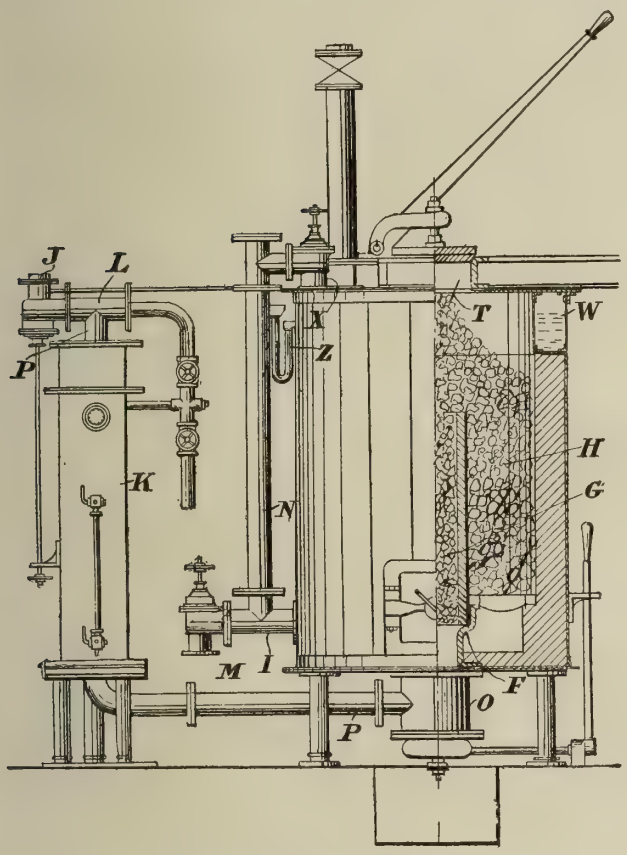
REGISTER OF PATENTS.

Manufacture of Gas.

TULLY, C. B., of New Southgate, and SHADBOLT, R. G., of Grantham.

No. 2368; Jan. 30, 1906.

The patentees' claim is for the manufacture, in a producer having two concentric generators, of gas suitable for heating, illuminating, or power purposes, by effecting the conversion of the carbon dioxide present in the gas coming from the generator into carbon monoxide by separating the solid carbonaceous fuel charged into the generator into a main or generating portion from which the gas is formed by the addition thereto of air, or air and steam, either continuously or intermittently, and an auxiliary or conversion portion which is surrounded and adequately heated by the main portion, and through which the gas containing carbon dioxide on its way from the main portion is caused to pass.



Tully and Shadbolt's Gas Producer.

The invention can be applied in connection with producers of various constructions and worked under suction or pressure. In the construction shown, it is designed to be worked as a suction-gas producer; the producer being of vertical cylindrical shape. The bottom of the producer has a central outlet hole for gas and ashes; and the annular space between this hole and the outer wall of the producer is fitted with grate bars, located above a recess (of annular shape) which serves as an air and steam supply chamber and also as an ash-pit, with access through a doorway formed in the outer wall of the producer and normally closed by a door. Supported centrally within the producer by the tubular support F is a vertical tube G, of refractory material, extending upward to a considerable height in the producer, and forming between itself and the wall of the producer an outer annular gas-generating chamber H, located above the grate-bars and designed to contain the fuel to be converted into gas. The interior of the tube G forms a vertical reducing chamber to contain the fuel designed to convert carbon dioxide in the gas produced in the chamber H into carbon monoxide—the two chambers being in direct and free communication with each other through the upper portion of the producer. To one side of the air and steam supply chamber is secured a branch pipe I, connected to an air supply pipe M, provided with a hand-controlling valve, and to a steam supply pipe N that extends upwardly to the top of the apparatus, where it is provided with a hand controlled valve. The valves enable the quantities of air and steam respectively to be admitted to the chamber to be regulated as required. Secured to the bottom of the central support F, and below the vertical tube G, is a vertical tubular outlet branch or box O, provided at one side with an outlet pipe P for the escape of the gas that has been treated for the conversion of carbon dioxide therein into carbon monoxide. At the bottom of O is a movable door connected to an arm secured upon a spindle that can be rocked by a hand lever, so that the door can be quickly lowered for the discharge of ashes from the tube G into an ash-pit below and again closed. Or the ashes may be discharged in any other convenient manner.

The top of the producer is provided with a centrally arranged fuel charging aperture T, normally closed by a door carried by one arm of a pivotted-hand lever. Fuel can be charged through the opening T into each of the fuel chambers G H.

The upper part of the producer is provided with a steam or water vapour generator W, which may (as shown) conveniently comprise an annular metal vessel constituted by inner and outer metal cylinders and top and bottom annular plates suitably connected together; the generator being arranged between the top of the refractory wall of the producer and the roof of the producer, and forming practically the top section of the wall of the latter. The steam-generator is provided with a steam outlet X connected to the valve controlled steam supply pipe N. The steam-generator W is provided with a water-supply pipe Z connected so that a constant height of water is kept in the steam-generator.

The top of the gas-generator is provided with a gas outlet pipe or chimney leading to the external atmosphere, and normally closed by a valve which, when the generator is burning with a slow fire, may be opened either by hand or automatically, to maintain the combustion of the fuel, and, consequently, to prevent the temperature of the generator falling too low.

The gas outlet pipe P extends upward to a pipe leading to the main outlet pipe J provided with a hand controlled regulating valve. The outlet pipe extends to a hydraulic main, purifier, gasholder, or other place, as desired; or it may, when desired, be connected to a carburettor. For this purpose, the pipe may be provided at a vertical portion of its length with a surrounding vessel K, designed to contain oil for carburetting the gas and provided with an outlet pipe having two valve controlled branch pipes whereby the volatilized oil can be admitted at will to the pipe L, where it will be mixed with the gas from the pipe P at a point just beyond the carburetting vessel, or the volatilized oil can be conveyed to a gasholder or other place and be mixed with the gas from the producer after it has been purified.

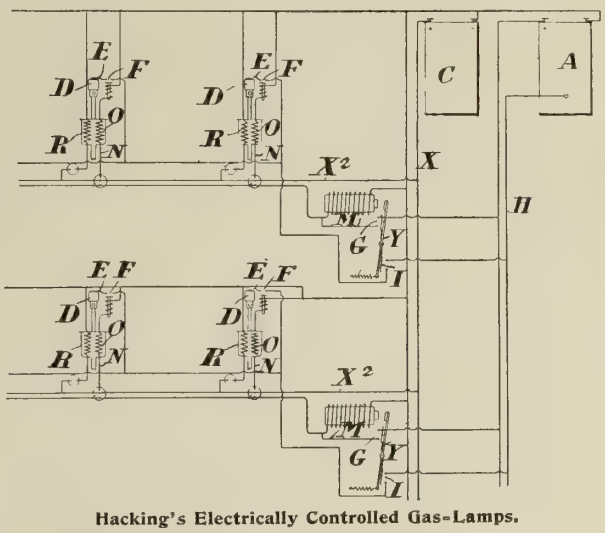
The arrangement is such that, when in operation, air or steam, or air and steam, can be drawn in regulated quantities through the producer by the suction action of an exhauster (not shown) whereby the fuel in the outer gas-generating chamber H will be raised to a high temperature and converted into gas, which will flow upward through the chamber and then downward through the fuel in the inner reducing chamber G; the latter fuel being heated to a high temperature by the combustion of the fuel in the outer chamber H and by the escaping gas, and acting to reduce the carbon dioxide in the escaping gas to carbon monoxide—the resulting gas flowing through the pipes P, L, J, to any desired place and being carburetted or not by the carburettor K, as desired.

Controlling or Lighting-up Gas-Lamps by Electricity.

ELECTRICAL IMPROVEMENTS, LIMITED, and HACKING, A. E., of Nottingham.

No. 12,025; May 23, 1906.

The patentees arrange that a single sparking coil A, supplied from a moderately low voltage cell or battery C, can be used for lighting up a number of gas burners D, to each of which a suitable sparking circuit E is fitted. The burners are arranged in respect of each other in parallel within a compound or parallel circuit, and so that each burner has a separate and independently operating sparking circuit controlled by a single and independent automatically acting sparking switch F, connected up within the low-tension circuit.



Hacking's Electrically Controlled Gas-Lamps.

Within this low-tension circuit (between the battery C and the sparking coil) is provided, for each branch, an electro-magnetic switch G, which is momentarily closed each time a sparking switch (such as F) through a hand-operated switch, is brought into action to light up a burner. For example, X is the positive main wire from the battery, and X^2 are the low-tension wires therefrom to each branch. These wires pass through the switches of the respective lamps and lead to electro-magnetic devices which control the operation of the switch G. Between the main conductor H from the sparking coil A and each of the spark wires of the branches of the compound or parallel circuit (within which the lamps are arranged in parallel) is provided an electro-magnetic switch I, operating so that any one branch of the compound or parallel circuit and any one lamp in the particular branch can (at will) be connected up to the main conductor H, dependent upon which switch of the particular branch is operated by hand.

Normally all switches are open and all circuits broken. Now if a hand switch of any particular lamp in any particular branch is operated, it closes the low-tension or battery circuit to the particular branch (leaving all the other lamps and branches broken), energizes the electro-magnetic device of the particular branch, and the particular sparking switch F, with a result that the latter is closed, and the rocker bar Y is moved to close the switches G and I. This has the effect of coupling the coil A to the battery C (through the shunt wire M) and closing the particular sparking branch to the sparking main H, the whole of the

energy in the battery and the coil being at the time utilized in the particular branch for the lighting up of the particular lamp only. The low-tension wire N passes through a solenoid or other suitable device O arranged to turn on the gas simultaneously with the operation of the sparking—a valve electrically operated for turning on and off the gas when required being well known. For illustrative purposes, a gas turning-off electro-magnetic connection is represented at R coupled to the low-tension branch through a separate switch, which is the hand-operated turning-off switch.

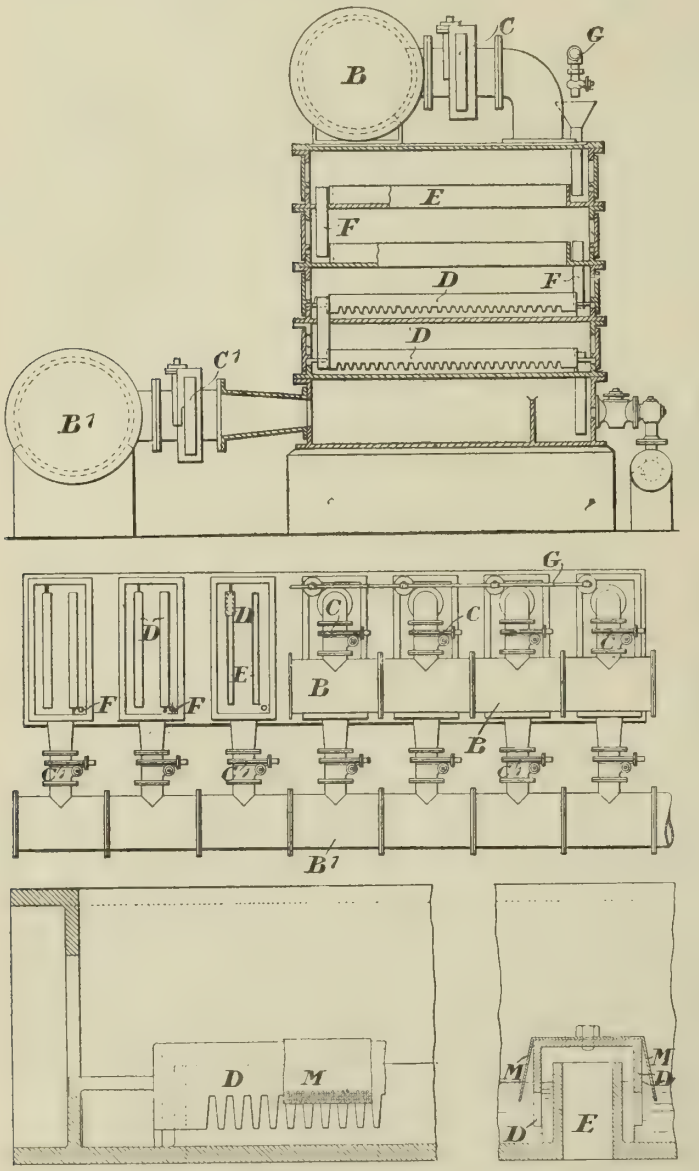
The patentees say they are aware that it has hitherto been proposed to light up gas-lamps by the use of a single battery and a single sparking coil—such lamps to be arranged on either parallel or series circuits, and, further, to use electro-magnetic devices connected up by a shunt within the low-tension circuit to automatically come into operation when the low-tension circuit is closed, to turn on the gas and to close the high-tension circuit to a particular lamp. But these features have been hitherto arranged in a manner distinctive from the present invention, inasmuch as the lamps are here arranged in parallel within branches of a parallel circuit, with each branch provided with automatic switches to the mains, which are in addition to the magnetic devices for closing the sparking circuit at each burner—the automatic switches being essential in the double parallel arrangement, as defined, because each branch and each burner in such branch can be independently, from one hand switch, coupled to the mains.

Gas-Washers.

Wilton, G., of Mark Lane, E.C.

No. 13,787; June 15, 1906.

This invention relates to a gas-washer divided vertically into sections, each consisting of a series of superimposed chambers; the uppermost chamber of each section being in connection with the liquor supply and gas outlet, and the lowermost chambers in connection with the liquor outlet and the gas supply main. Thus each section may represent a unit of the capacity of the washer as a whole; and by providing an additional section, the washer may be continuously worked at its maximum capacity, and the total capacity of the washer be increased by the addition of a further unit section without altering the connection between the original sections and the mains.



Wilton's Gas-Washer.

Assuming that the washer shown is capable of dealing with (say) 6 million cubic feet of gas per twenty-four hours, it is divided into seven vertical sections or elements, so grouped together as to form practically one apparatus. The sections are connected top and bottom to gas-mains B and B^1, which have separate connections to each section with corresponding valves C C^1 for closing the inlet and outlet of the mains. The mains adjacent to the sections will preferably be divided into sections of substantially the same width as each section of the washer. Thus each section of the washer and its sections of mains, with valve connection, forms a unit allowing of the apparatus being increased in capacity according to requirements, and yet always complete whether consisting of one or many sections. Each section of washer consists of a series of superimposed chambers formed with one or more elongated hoods D, which in a rectangular apparatus will preferably run lengthwise of the respective chambers, and cover a correspondingly shaped opening E in the floor of each chamber—the opening being surrounded by a wall projecting up to the hood D in the usual manner. The hood at the end where the liquor enters the chamber will be provided with a vertical flange closing the space between the hood and the end wall of the chamber, and preferably provided on its upper edge with an extension projecting slightly downward if required, and resting on the edge of an opening in the chamber side of sufficient dimensions to allow the hood being raised and removed through it.

By forming one end of the hood D with a vertical flange as described, the liquor is caused to flow first along one and then along the other side; and if two hoods are employed in each chamber, the flanges are so arranged that the liquor first passes along the side of the first hood, back between the two hoods, and then along the outside of the second hood to the exit, whence it passes, by suitable depending pipes F, to the chamber next beneath. In this manner the liquor flows through each section of the apertures from top to bottom.

The liquor is fed from the liquor main G into the uppermost compartment by a pipe flared or funnel-shaped at the top—suitable valves being provided to allow of the liquor supply being cut off from any particular section.

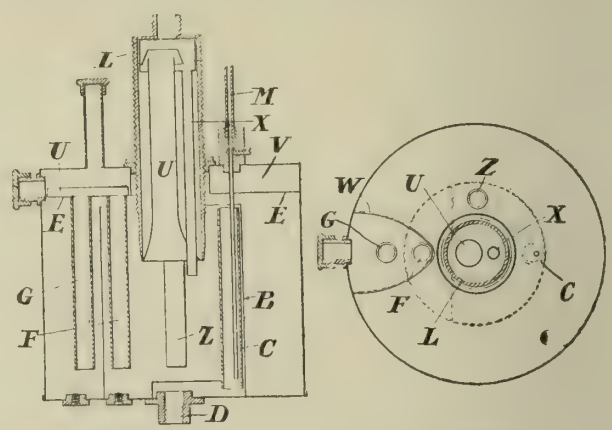
The longitudinal side of the hood D, which is serrated in the ordinary manner, is fitted with a supplementary detachable apron or hood M projecting outward at an angle. It consists of sheet metal bent to a section corresponding with the crown of the hood, so as to be slid lengthwise on to and off the hood, or otherwise suitably placed on it so as to be removed for cleansing when required. In this manner one or more supplementary aprons may be fitted; and by removing the fastenings, the aprons may be lifted off. These aprons are for med with a series of holes close together—say three or four rows deep along their lower edge where immersed in the liquor. The ends of the hood are closed entirely, or may be similarly perforated or serrated. They will, however, generally be formed with some parts projecting down to the floor of the compartment, or other means will be provided to suitably support the hood in its required position.

Lighting and Extinguishing Gas-Burners.

Bauduin, J. G. H., of Maastricht, Holland.

No. 24,314; Oct. 31, 1906. Date claimed under International Convention, Nov. 3, 1905.

This apparatus for lighting and extinguishing gas-burners from a distance is of the type wherein each of the burners to be lighted and extinguished has provided between it and the source of gas a receptacle containing a non-freezable liquid and comprising two compartments communicating with a closed upper chamber, and wherein the lighting and extinguishing of each burner is caused by the opening and closing of the lower end of a tube leading to it, owing to the lowering and raising of the level of the liquid in one of the compartments by the variation in the pressure of the gas. The objects aimed at by the inventor are to provide means for preventing the oil employed as the opening and closing liquid from being carried up to the burner by the gas in the form of small drops (which is liable to occur in the case of excessive temperature), and to provide means for securing more certainty of action as regards extinguishing.



Bauduin's Automatic Lighter and Extinguisher.

The receptacle for the "non-freezable liquid" (oil) is divided into two compartments by a wall B concentric with the external peripheral wall of the chamber. V is a closed chamber divided from the interior of the case by a horizontal plate E and a wall concentric or eccentric with the external peripheral wall. C is a pipe whereby the gas supply union D is kept in permanent communication with the upper portion of the apparatus; and L is the tube through which the gas passes to the burner. M is a tube for supplying gas to a pilot-light.

The interior of the tube L is provided with a pipe U, above which there is arranged a small cap, and at one side of which (also within the tube) is arranged another tube X, of small diameter, the upper end of which is connected to the bottom of the cup which surrounds the cap. The effect is that drops of oil drawn along by the gas traversing the apparatus are kept back by the cap, fall therefrom into the cup, and return to the interior of the compartment.

For the purpose of rendering more certain the extinguishing of the

burner, the wall B not reaching quite up to the level of the plate E, there are provided two tubes F and Z depending into the central compartment from the horizontal plate E, while there is a single tube G, equal in diameter to the tube F, depending from the plate E into the other compartment, and above the plate E there is soldered a low wall W, which is adapted to serve as a dam around the upper ends of the two tubes F and G, so as to prevent oil on the greater portion of the plate E from passing down the tubes F and G.

The apparatus being connected to a gas supply pipe in which the gas is at the pressure of (say) "r mm.," at which the burner is to be lighted, it is charged with a non-volatile and non-freezing oil, the density of which remains practically constant at the temperatures that will obtain in the apparatus. The oil flows through the pipes F and G into the two compartments until it begins to escape through the overflow, which during the filling has been opened but is now closed. The two chambers are now under a pressure of "r mm," and the surface of the oil therein is consequently at a distance of "r mm.," divided by the specific gravity of the oil below the horizontal plate E, while the pipes F, G, and Z are full of oil. The tube L is now regulated (if necessary) so that its lower end is above the level of the oil in the centre compartment, so that, if the tube L is in communication with the burner, the latter is lighted.

In order to extinguish the burner, the pressure is gradually increased to "r + 10 mm.," and is maintained at that height for about two minutes. Consequently the level of the oil in the centre compartment falls a distance of 10 mm. divided by the specific gravity of the oil, and the oil flows through the pipes F and G into the space within the wall W, over that wall upon the horizontal plate E—oil being also forced up the tube Z into the space outside the wall W and over the plate E. If the gas pressure be now suddenly reduced to "r – 5 mm.," the oil outside the wall W and above the plate E is compelled to pass through the pipe Z into the centre compartment, wherein the tube is consequently sealed by the oil at its lower end, so that the supply of gas to the burner is cut off.

In order to relight the burner, the pressure is again given for about a minute, and oil is consequently forced from the centre compartment into the tubes F and Z so as to fill them and open the tube.

When the burner is lighted, only the oil from the tubes F and Z can enter the compartment itself; and as the cross sectional areas of these tubes are together considerably less than that of the compartment, the amount of oil therein is not sufficient to seal the pipe, so that the supply of gas to the burner will not be cut off, even if the gas pressure be reduced down to 10 mm.

APPLICATIONS FOR LETTERS PATENT.

3356.—Davies, T. M., "Lamps or lanterns." Feb. 11.
3395-6.—Killing, F., "Inverted lamps." Feb. 11.
3403.—Graetz, A. & M., "Inverted lamps." Feb. 11.
3436.—Dawe, P. H., "Retort charger." Feb. 12.
3489.—Montgomery, A., "Mantle support." Feb. 12.
3533.—Akt.-Ges. für Selas-Beleuchtung, "Mixing and supplying gases." Feb. 12.
3610.—Grcbach, G , "Producing air gas." Feb. 13.
3618.—Hochenegg, C., "Emergency illumination for theatres and the like." Feb. 13.
3689 —Tully, C. B., "Production of gas." Feb. 14.
3702.—Morris, D. J., A. T., & A., "Acetylene-generators." Feb. 14.
3706.—Pöschl, A., "Inverted lamps." Feb. 14.
3800 —Gover, E. W., "Water-meters." (A communication from E. C. Buck.) Feb. 15.
3805.—Fox, H. L., "High-pressure lighting and heating apparatus." Feb. 15.
3812.—Anderson, D., "Self-intensifying gas-lamps." Feb. 15.
3866.—Carruthers, F. J. C., "Gas-turbines." Feb. 16.
3869.—Hawley, W., "Purifier-grids." Feb. 16.
3911.—Wilton, G., "Manufacture of producer gas or suction gas." Feb. 16.
3917.—The Helis Cell and Accumulator Company, Ltd., and Schauli, G., "Gas-igniters." Feb. 16.
3942.—Poupard, W. G., "Gas-cookers." Feb. 18.
3989.—Fischer, F., "Inverted burner." Feb. 18.
4035.—Brock, W. E., and Wyatt, R., "Ascension-pipes and hydraulic mains." Feb. 18.
4067.—Parker, T., "Retorts for the distillation of coal and other carbonaceous substances." Feb. 19.
4094.—Read, E., and Spencer, F., "Regenerative furnaces for gas-retorts." Feb. 19.
4112.—Anderson, W. & H., "Inverted burners." Feb. 19.
4202.—Bray, A., "Inverted burners." Feb. 20.
4260.—Robin, J. I., "Anti-vibrator." Feb. 20.
4388-9.—Freeman, C., jun., "Acetylene-generators." Feb. 22.
4401.—Bray, J. W. & A., "Vertical inverted incandescent gas-burners." Feb. 22.
4445-6.—Ljungström, B., "Gas-turbines." Feb. 22.
4483.—Cuttell, T. L., and the Anti-Vibration Incandescent Lighting Company, Ltd., of Leeds, "Coin-controlled gas-meters." Feb. 23.

The Disputed Gas-Coal Contract at Edinburgh.

In the Court of Session at Edinburgh last Thursday, Lord Salvesen was informed that the action by the Edinburgh and Leith Gas Commissioners against the Kinneil Cannel and Coking Coal Company, Limited, of Glasgow (*ante*, p. 414) had been settled. The Commissioners sued for £305 15s. 2d. as the amount of loss they had sustained through having had to buy coal on account of non-delivery of Kinneil coking single nuts, which defenders had contracted to supply. The action has been settled by the defenders agreeing to pay the sum of £200 and expenses.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

Electricity Supply in Newcastle.

Sir,—In your "Electric Lighting Memoranda" of Feb. 26, there are three clauses to which we must take exception. First, on p. 524, you say, "However, taking out some of the undertakings showing superior successes, and mentioning them in alphabetical order, there is. . . Newcastle-upon-Tyne with 269,263 8-candle power lamps, and 1150 consumers." Again, on p. 525, you state: "It is observed that, even the undertakings in the larger provincial cities and towns have not done anything of a conspicuous character in taking up new consumers . . . Newcastle and District, 100. From the noise that is made about the Newcastle Company and its great activity, supplemented by the 'Electrical Bulletin,' it might have been imagined that something more extensive was being accomplished in obtaining new consumers." And further down on the same page occurs the phrase: "The horse-power connections of some of the principal cities and towns are as follows . . . Newcastle-upon-Tyne, 6500."

It is unfortunate for any proposition if the facts produced in support of the argument are manifestly inaccurate. Your standard of reference is the "Electrician" tables of electric supply and traction undertakings of the United Kingdom, 1906-7.

With regard to your first point, Table I., published Jan. 4, credits to the Newcastle and District Electric Lighting Company 1150 consumers, using an equivalent of 269 263 8-candle power lamps; but this Company's operations only cover a part of Newcastle. There is another Company, the Newcastle-upon-Tyne Electric Supply Company, whose work is scheduled on Table II., published on Jan. 18. This Company has a total of 4350 consumers; while its private lighting work, reduced to the equivalent of 8-candle power lamps, is recorded as 221,650. The total for Newcastle should therefore be 490,913 8-candle power lamps, utilized by 5500 consumers.

With regard to your second point, the number of consumers connected to the Newcastle and District system as shown in the "Electrician" supplement of Jan. 12, 1906, was 1050, while this year the figure is 1150, giving the increase of 100 that you mention. But as regards the Newcastle-upon-Tyne Company, whose doings you ignore, the number of consumers connected up to Dec. 31, 1905, was 3800; while Table II. of the "Electrician" this year gives them as 4350—an increase of 550. Your increase figures for the whole area of Newcastle are therefore less than one-sixth of their right value. Under the circumstances, your remark as to "the noise made about the Newcastle Company and its great activity, supplemented by the 'Electrical Bulletin'" [it is not the "Electrical Bulletin," by-the-bye, but the "Tyneside Electrical Pioneer"] loses point. The "Pioneer" is the organ of the Newcastle-upon-Tyne Company—the one that shows over 13 per cent. increase [550] on its consumer connections during one year.

Taking your third point, Table I. of the "Electrician Supplement" this year gives the Newcastle and District Company as having 6500-horse power connected. Table II. gives the Newcastle-upon-Tyne Electric Supply Company as having a 20,300-horse power motor load. This, we may add, is exclusive of traction load. The total for Newcastle is, therefore, 26,800-horse power. In this example of the "great industrial cities of the provinces," therefore, the development of electricity for motive power is not so "tortoise-like" as you suggest. We therefore think that you have not exhibited perfect fairness in limiting your investigations to Table I. The figures given above are all free from tramway or traction results; and it is our opinion that an investigation into the industrial expansion of electricity as typified by the progress in a prominent city should include the operations of all electrical companies working there.

For the Newcastle-upon-Tyne Electric Supply Co., Ltd.—J. A. Seager.

Newcastle-upon-Tyne, March 1, 1907.

[We have pleasure in publishing the above letter, and regret that the title of the Newcastle Company referred to in the "Electric Lighting Memoranda" last week was in error taken as being that of the larger concern. It had, when writing, escaped memory that there were two Companies operating in Newcastle. Throughout the article last week, however, it was made perfectly clear that the figures chiefly dealt with referred only to those undertakings without tramway loads; and our correspondent's Company come within the category of those with a tramway load. But that is no reason why, in our columns, electricity supply for other purposes in Newcastle should not have its full due and therefore we cordially give place to this amendment of the particulars published last week.—Ed. J.G.L.].

Gas Supply of Perth (Western Australia).

Sir,—I note in your issue of Dec. 18 a paragraph throwing doubts on my figures as given in the "Journal" for Sept. 18. I desire to state that these figures, relating to street-lamps, Lucas lamps, and gas, are correct. They only refer to the Gas Department. Those referring to the net profit should have read for both gas and electricity.

As to the street-lamps. As before stated, there were 411 existing in May, 1901; and these, with the exception of 23 specials, were fitted with flat-flame burners charged (at 4 cubic feet per hour) at 6s. 8d. per 1000. The specials were tin lanterns fitted with Medway burners in April, 1900, as prior to that date all the lamps were of cast iron, as described in your issue of July 21, 1903. On the introduction of incandescents throughout the city, the price for erecting new lamps was reduced from £6 to £5 12s. 6d. for columns, and £4 0s. 6d. for brackets—an average of £4 16s. 6d. per lamp. This concession alone was sufficient to induce the Council to extend the street lighting (apart from the reduced charge for gas) to 3 cubic feet per lamp per hour at 6s. 3d. per 1000

W. G. Quicke.

Perth, W.A., Jan. 29, 1907.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills :—

Bills read a second time and committed : Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Birkenhead Corporation Water Bill, Birmingham Corporation Water Bill, Broadstairs and St. Peters Urban District Water Bill, Coventry Corporation Water Bill, Devonport Corporation Bill, Heywood and Middleton Water Board Bill, Newquay and District Water Bill, Pontypridd Urban District Council Bill, St. Neot's Urban District Council Bill, Selsey Water and Gas Bill, Southend Water Bill, Southport, Birkdale, and West Lancashire Water Board Bill, Tees Valley Water (Consolidation) Bill, Tynemouth Corporation (Water) Bill, Wisbech Water Bill.

The Devonport Corporation Bill has been referred to a Select Committee, consisting of Lord Hylton (Chairman), Lord Kilmarnock, Lord Abinger, Lord Ramsay, and Lord Sandhurst ; to meet to-day.

The Heywood and Middleton Water Board Bill and the Newquay and District Water Bill have been referred to a Select Committee, consisting of Lord Sanderson (Chairman), Earl Cathcart, Viscount Hill, Viscount Iveagh, and Lord Belhaven and Stenton ; to meet on Thursday.

HOUSE OF COMMONS.

Thursday, Feb. 28.

METROPOLITAN WATER BOARD (CHARGES, &c.) BILL.

On the motion for the second reading of this Bill,

Sir F. Dixon Hartland moved the rejection of the measure. He said he objected to the second reading of the Bill because he believed it was manifestly unjust. It was introduced because there was an undertaking that three years after the "appointed day" a Bill should be introduced to equalize the water-rates over the whole area supplied by the Metropolitan Water Board. He was connected with a large Company having premises in the City, and they paid water-rates to the amount of £8 a year. Water was only used for washing the hands of the clerks—nobody living on the premises. It was a fair rate ; but the premises had to be rebuilt, and the rate was raised to £69 for exactly the same quantity of water. This showed that the Bill would over-reach itself. The Bank of England were sinking wells on their own premises, so as not to come within the power of the Metropolitan Water Board ; and other bankers who were not going to submit to the enormous rates put upon them also proposed to do likewise.

Sir F. Banbury said that while the measure would cause the rating in London to be most unfair, and would cast an additional burden upon a large number of people, it would only in one district (Lambeth) result in any lightening of the existing burden. For this reason alone the Bill ought, in his opinion, to be rejected.

Mr. E. B. Barnard said that, after the distinct instructions in the Metropolis Water Act of 1902 that a Bill was to be brought in providing for uniform charges, he did not think the question arose as to whether such charges were desirable. The mover and seconder of the amendment seemed to imagine that the Water Board were necessarily going to charge the maximum rate of 5 per cent. All the Board had to do was to produce to the House a scheme which would hold the balance of fairness and justice among the 7 millions of people inside the Metropolitan water area.

Mr. Burns said he had risen on behalf of the Local Government Board to say that the Water Board had come to the House of Commons with regard to a statutory obligation imposed upon them by Parliament some few years ago. A clause in the Metropolitan Water Act, 1902, specifically laid it down that they should not, until otherwise determined, reduce the water-rates below those in force in June, 1902. The Board had within three years to promote a Bill for a uniform scale of charges ; and Parliament would certainly stultify itself if first it ordered a Bill to be prepared, and then, when this was done, did not give the Board the opportunity of passing the uniform scale for the whole of London. He suggested that Parliament clearly intended that there should be uniformity of charge, and placed the obligation on the Water Board to introduce it. The Board now sought the opportunity, and without further delay, for the discussion of technical matters ; and their proposals should be read a second time and sent to a Committee.

After some further remarks, the amendment was rejected by 219 votes to 44, and the Bill read a second time.

The following further progress has been made with Bills :—

Bills read a second time and committed : Basingstoke Gas Bill, Falmouth Gas Bill, Maidstone Gas Bill, Shanklin Gas Bill.

The following Bills have been formed into groups : (A) Annfield Plain and District Gas Bill, Brockenhurst Gas Bill, Llandrindod Wells Gas Bill, Mitcham and Wimbledon District Gas Bill, and Shanklin Gas Bill. (B) Boston Spa Gas Bill, Falmouth Gas Bill, Grays and Tilbury Gas Bill, Maidstone Gas Bill, and Worthing Gas Bill.

The Burnley Corporation have asked leave to deposit a petition for a Bill.

Mr. Harmood-Banner, the member for Everton, has given notice of his intention to ask the Home Secretary next Thursday "whether he intends to carry into effect the recommendations of the Departmental Committee to control the supply of poisonous gas for heating and lighting purposes which does not possess a distinct and pungent smell."

The Directors of the British Gaslight Company, Limited, recommend a dividend at the rate of 10 per cent, per annum for the six months ending Dec. 31 last, free of income-tax.

MISCELLANEOUS NEWS.

WEST HAM GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week, at the Liverpool Street Hotel, E.C.—Mr. J. Lister Godlee in the chair.

The Secretary (Mr. A. G. Snelgrove) read the notice convening the meeting ; and the Directors' report and the accounts were then taken as read

The Chairman, in moving their adoption, first expressed the deep regret of the Directors that Mr. J. J. Griffiths had been obliged by the state of his health to resign his seat at the Board, and then referred to his excellent service as a Director during the past fourteen years. To fill the vacancy, the Directors had appointed Mr. F. W. Carter, who, he (the Chairman) believed, would add strength to the Board.

REDUCTIONS IN PRICE—THE COAL MARKET.

In comparing the accounts of the past half year with those of the corresponding period of 1905, it would be remembered that the price of gas was lowered from 2s. 10d. to 2s. 9d. per 1000 cubic feet from Midsummer last. It would also be recollected that up to Midsummer, 1905, 2s. 11d. was being charged, that the price was then reduced to 2s. 10d., and five quarters later another 1d. was taken off, bringing the price down to 2s. 9d. He thought the accounts presented that day showed that the Board had not been too sanguine in the view they took of the situation, and that the reductions had been justified. The prices were subject to considerable discounts when gas was used for power purposes only. He hoped the Company would be able to maintain the current price, and at some future time lower it. The Directors would certainly do their best to avoid raising it. Nothing at present seemed to suggest any need to do this, except perhaps the price of coal. The whole of their coal requirements, however, for the present half year were provided for ; and the greater part would be under the contracts made two years ago. There was no doubt they would have to pay under their next contracts decidedly higher prices than those at which they had previously purchased. This was unpleasant ; but he did not see that anything was to be gained by getting angry with the colliery owners, who were not yet bound, as gas companies were, by statutory enactments as to the price to be charged for what they had to sell. But the highest prices quoted in the newspapers were not always the prices that had to be paid. The proprietors might, he thought, trust the Directors to watch carefully over their interests, and to make the best bargains they could, consistently with obtaining coal suitable for their purposes.

PROFITS AND INCREASED BUSINESS.

The revenue account showed a profit of £32,417, or upwards of £2000 more than the result a year ago. The figures in the account were larger all round ; and as 80 million cubic feet more gas had been sold than in the second half of 1905, this was not surprising. The amount of gas sold in the whole year showed an increase upon 1905 of 157 million cubic feet, which represented 11·3 per cent., notwithstanding the bright, warm weather occurring in the second half of the year. The sales in the first two months of the present year were showing similar increases over last winter. The increase for the past half year through the ordinary meters was 1·5 per cent. ; the large balance being mainly through the prepayment meters. This continued increase of business, of course, involved a considerable capital outlay. During the year, there had been laid about 6 miles of new mains, and about 1¾ miles relaid. They had delivered 8805 prepayment meters, and 8196 stoves to be used with them, in addition to 2148 ordinary meters and 2897 stoves ; and there had been a liberal writing-off by way of depreciation. Nevertheless, at the present time, the fixed capital employed stood at 12s. 5d. per 1000 cubic feet, as against 12s. 9d. last year. The figures he had given as to the number of meters and stoves delivered to consumers should be supplemented by those of the number returned. The effect of these was not so marked in the prepayment branch ; but while they had delivered 2897 ordinary stoves and 2148 ordinary meters during the year, the actual increases in those now in use over the number this time last year were only 777 and 809 respectively—2120 stoves and 1339 meters having been returned. Therefore to obtain an increase of 777 stoves, they had had 5000 pass through their hands ; and the increase of 807 meters involved dealing with about 3500 of them.

SULPHUR COMPOUND RESTRICTIONS.

The Company had this year joined with several other Gas Companies in the promotion of a Bill in Parliament for releasing them from the restrictions to which they were now subjected as to the amount of sulphur compounds in the gas supplied. The large London Companies had already been freed from these restrictions ; and by an Act of last session, which was strongly, but unsuccessfully opposed, several other companies were released. The greater number of suppliers of gas in the country had never been under the restrictions ; and although their own Company was not so badly off as some others, yet the Directors thought, in view of the course adopted by Parliament last year, it would be right, now that a suitable opportunity offered, for them to be placed in as favourable a position as their neighbours. The Bill had been introduced into the House of Commons ; and the time for presenting petitions against it in that House had passed without any being presented, so that it would be an Unopposed Bill there. It was hardly likely, under these circumstances, that the Bill would be opposed in the Upper House.

A YEAR'S PROGRESS.

Reverting to figures, and taking those relating to the whole year rather than those of the half year only, he found that carbonizing wages came out at 2·81d., as against 2·93d. in 1905 ; and the total manufacturing charges were 8·68d., as against 9·05d.—a reduction of rather more than ½d. The amount of gas made in the year was 1,638,054,000 cubic feet—being an increase of 10·9 per cent. ; while

the quantity sold showed an increase of 11·3 per cent. The unaccounted-for gas during the year was 4·31 per cent. on the make, or 0·25 per cent. less than in 1905, when only three of the Metropolitan and Suburban Companies in "Field's Analysis" showed a better result than that of the West Ham Company. The consumers through ordinary meters now numbered 22,032—an increase of 808; while those employing slot meters now numbered 25,491, or 7348 in excess of the figures for a year ago. The demand for these meters continued very brisk. Their use (which was only begun four years ago) had, of course, opened up an entirely new field of demand; and in time he supposed they would find this getting filled up. But that time had not come yet; and fresh applications kept flowing in rapidly. It was interesting to note that this business at the present time involved the collection of more than £1300 a week—all in coppers.

CAPITAL ACCOUNT—NEW RENTAL DEPARTMENT.

The balance on capital account at the end of the year was about £69,000; so they had money enough for the present. But the capital expenditure in 1906 was more than £77,000; and, as he had said, the business was again increasing at a fast rate. Therefore, the £216,000 which the Company were authorized to raise under their Act of 1902 would not last them the twenty years which their opponents, he believed, in the Committee rooms prophesied it would do. In conclusion, the Chairman mentioned that, after a year's experience, the Board were thoroughly satisfied as to the wisdom of the step taken in setting up a separate rental department. The material reduction of bad debts was partly due to the improvement which the department had introduced.

The DEPUTY-CHAIRMAN (Mr. T. S. Geere) seconded the motion.

COST OF STOVE-FIXING.

Mr. CLEVERLEY asked whether the Directors had ever contemplated a scheme whereby the diffidence of certain consumers to pay £1 or £1 10s. for the fixing of cooking-stoves might be removed. In one southern town, an admirable system existed, whereby this was arranged without any appreciable expense to the consumer. It was managed something like the prepayment supply. A little extra charge was made to the stove-rental; and the company estimated that, after about eight or nine years, the fixing expenses had been paid. They did not ask for any ready money; but just put this small increment to the rental, and so recouped their outlay. This was to the advantage of both company and consumer. The manager spoke highly of the system, and said he could recommend it to all companies.

The SECRETARY pointed out that their own Company did not charge anything like a sovereign for fixing cooking-stoves. The charge was only 7s. 6d.; so that it was not worth while raising the question.

The CHAIRMAN said the view of the Board was that the proper thing to do was to keep as low as possible the costs for fixing stoves. With their small figure, he doubted whether there would be any advantage in making the alteration suggested.

Proposed by the CHAIRMAN, and seconded by Mr. H. CECIL PELLY, dividends at the rates per annum of 5 per cent. on the preference stock, and £5 2s. 6d. on the consolidated ordinary stock were declared.

The retiring Directors (Messrs. T. S. Geere and C. F. H. Leslie) and the Auditor (Mr. W. Hopkins) were unanimously re-elected.

Complimentary votes were passed to the Chairman and Directors, and to the Engineer and General Manager (Mr. John Clark), the Secretary (Mr. A. G. Snelgrove), and their respective staffs.

The acknowledgment of the Chairman and the other gentlemen concerned concluded the ordinary proceedings.

The Joint Bill for the Removal of Sulphur Restrictions.

A Special General Meeting was then held, at which

The CHAIRMAN submitted the Bill that the Company, in conjunction with six others, are promoting for the purpose of removing the restrictions referring to sulphur compounds other than sulphuretted hydrogen. The provisions of the Bill having been explained by the Chairman, he proposed for adoption a resolution recording the approval of the proprietors to the promotion of it. He expressed the hope that no one would go away with the idea that the Company were going to deluge West Ham with a large quantity of sulphur. This was not their intention.

Mr. FRED. NICHOLSON seconded the motion; and it was unanimously carried.

SOUTH SHIELDS GAS COMPANY.

Jubilee of the Undertaking.

The Annual General Meeting of this Company was held at the Offices, Chapter Row, South Shields, last Thursday, under the chairmanship of Dr. J. F. ARMSTRONG.

The CHAIRMAN, in moving the adoption of the report, said the past year was rather a record one. It was the jubilee year of the Company; for it was on June 26, fifty years ago, that they obtained their first Act of Parliament. He had been present as a Director at every annual meeting for the past thirty years; and this was the ninth occasion on which he had had the honour of presiding. They could, he thought, look back upon these nine years with a fair amount of satisfaction. They had thoroughly overhauled, and tried to bring up-to-date, the plant of the Company. During the past twelve months, they had been endeavouring to complete the re-casting of the Shields works. The inclined retorts had proved a great success, and had enabled them to close down the Jarrow works during the summer months and supply the whole of their district from South Shields. The four old purifiers at Shields were found to be obsolete, and totally inadequate. They had been dismantled, and substituted by larger purifiers of the latest improved design. For many years there had only been one gasholder for use at the Shields works; and during the past year a new holder had been constructed in an existing tank—it being one of the three-lift type, instead of a two-lift as originally. In this way its storage capacity had been increased 50 per cent. The lift which travelled clear of the columns and guide-framing was designed by their Engineer (Mr. T. H. Duxbury) in a most masterly way. Both the purifiers and holder had been put into use during the last fortnight only; and they would be a great advantage in the future running of the local works. The process for the production of sulphate of ammonia, too, had been entirely replaced by new apparatus. When completed, the Directors believed the works would be unique and economical, and bear comparison with any other of similar capacity in the kingdom. The one drawback had been the want of railway connection with the works. The coke, breeze, tar, and ammonia had all to be carted from the yard, which added considerably to the working expenses. It was mentioned at the last annual meeting that the Directors were contemplating the re-casting of the Jarrow works, and bringing them into a more satisfactory working condition. Some of the plant there was worn out and almost past repair. Their Engineer submitted a report, with preliminary plans and estimates, dealing with the various systems of modern carbonizing plant. He brought to their notice the system of vertical retorts which was in use in Berlin and other Continental towns, and which the Engineer personally inspected. Mr. Duxbury's report was so favourable that they put a stop to all alterations, and repaired the old hand-stoking retort-beds so as to last a year or two longer, to wait the result of further trials with vertical retorts. In his (the Chairman's) opinion, these vertical retorts in a short time would supersede every other process of gas manufacture. They were reported to produce more gas from a given amount of coal, more ammonia, and less tar; but a better quality of tar, and richer in naphthalene. After a prolonged negotiation with the respective Corporations of South Shields and Jarrow, they had finally arranged to light the whole of the public gas-lamps in the two boroughs with incandescent burners. The installation was now working in many of the streets, and was a great improvement on the light given by the old flat-flame burners, far superior to the electric light, and less costly to the ratepayers. The continued increase in the gas sales was extremely satisfactory. Customers who had tried the electric light were constantly coming back to gas, either wholly or partially. There had been an increase in the sale of gas during the year of 12,518,525 cubic feet. A larger business had been done, too, in prepayment meters—2745 having been fixed during the twelve months. They had, at the close of last year, 23,522 meters in use. The wages paid amounted to £22,977, so that they were large distributors of money and large employers of labour; and they were also about the third or fourth largest ratepayer in the borough. The profits from residuals as a whole had been well maintained, though prices had ruled somewhat lower than in the preceding year. There had been an increase in the cost of coal of over £1000, due partly to a higher price and partly to the increased quantity carbonized. The increased price of raw material generally, prevented for the time being any reduction of the price of gas being considered. The income for the past year was £84,524, against £81,225 for the previous year, or an increase of £3298. The expenditure was £62,604, against £60,202, or an increase of £2401. The balance of profit was £21,919, or an increase of £896; and the balance available for the year 1906 was £14,130, or an increase of £1903. The capital expenditure up to the end of the year amounted to £390,851, against £378,168 in 1905, which was an increase for the past year of £12,683. A great deal of the expenditure was due to laying a new main to Harton. In conclusion, the Chairman referred to the excellent work done by the Secretary (Mr. J. H. Penney), and Mr. Duxbury.

Alderman SMITH seconded the adoption of the report, which was agreed to.

A dividend of 4 per cent. for the half year, making 8 per cent. for the year, was afterwards declared.

READING GAS COMPANY.

A Record Year—Further Reduction in Price.

The Annual General Meeting of this Company was held last Tuesday—Mr. J. OKEY TAYLOR, J.P., in the chair.

The SECRETARY AND ACCOUNTANT (Mr. A. Canning Williams) having read the notice convening the meeting, the report and accounts for the year ending Dec. 31 were presented. In submitting the latter, the Directors felt they had every reason to congratulate the proprietors on the results shown. They stated that notwithstanding the reductions in the prices charged for gas in 1906 compared with those in the previous year—equal to a total of more than £3000—the profit on the year's working had been more than maintained. Under these circumstances, they had resolved to make further reductions. The quantity of gas sold during the year was 515,807,200 cubic feet, compared with 487,620,100 cubic feet for the year 1905—an augmentation of 28,187,100 cubic feet, or 5·7 per cent.; and the number of consumers had risen from 12,808 to 13,887. The accounts showed that the revenue in the twelve months had been £94,813, and the expenditure £71,434; leaving a balance of £23,379 to be carried to the profit and loss account. The sum available for distribution was £29,531. Interim dividends of 5 per cent. per annum on the preference shares and ordinary stock for the six months ended June 30 last were paid on the 1st of September; and the Directors recommended that dividends at the same rate should be paid for the second half of the year (less income-tax), and £2974 transferred to the reserve fund, which would bring it up to £27,000, the amount authorized by the Company's Act of 1902.

The CHAIRMAN, in moving the adoption of the report, said that a year ago the Company were engaged in carrying out important alterations to the works, and when the proprietors last met only a portion of the extensions had been brought into operation, and the Directors could not tell what effect they would have upon the working. He then informed them that during the year 1905 they had had a larger amount of profit than they had ever had before in the history of the Company. Now, at the end of 1906, they had not only maintained this profit, but had exceeded it, and beaten all previous records. He did not know

that they could have any greater proof than this that the alteration to the works had tended to the prosperity of the Company. This large profit had enabled them to make up the reserve fund to £27,000, which was the maximum amount, and thus secure the stockholders' interests; and he thought this fact must tend to strengthen their feeling that they had invested their money in a substantial concern. Last year the Directors were in a position to reduce the price of gas by 1d. per 1000 cubic feet, and they were gratified to again feel themselves in a position to make a further reduction of 2d. He could say that it might have been 3d., if it had not been for certain circumstances relating to the future cost of coal and oil. However, the Directors had felt justified in announcing reductions in the price of gas during the past 14 months which would benefit consumers to the extent of about £9000 per annum. Every 1d. per 1000 cubic feet reduction meant a loss of £2200 in income. This spoke well for the prosperity of the Company. Since last year the consumption of gas had augmented; and there was no doubt that it would increase further still, because there was no greater encouragement to increased consumption than a reduction in price. Notwithstanding the amount given up, the actual sum received for gas last year had increased. This had always been his experience whenever they had made a reduction in price. The great prosperity of the Company had its effect upon the value of the stock. Two years ago their stock was obtainable at something like £105 or £106; but recently it had seldom changed hands at less than £114. This was a satisfactory feature; and he could follow it up with many more facts to prove that the Company was in a very healthy condition. During the past year they had made 28 million cubic feet more gas, and had expended upon their coal and oil £2538 less, than the year before; and, consequent upon the introduction of new stoking machinery, they had been able to save £1136 in labour in the carbonizing department. They were now paying dividends upon £317,500. It might be asked what value they had got for the expenditure upon the works. In reply, he might say that they had works of the most modern construction, where all the latest improvements had been brought into operation, and that they were obtaining from them results which were not surpassed by any other company. The ordinary expenditure of capital per million cubic feet of gas made was about £500; while theirs amounted to about £540. But it must be borne in mind that they had a vast amount of reserve power on the works. They were now making 550 million cubic feet; but if the population of Reading required it, they could give them 700 millions without any extra expenditure in plant, and with an outlay of (say) £8000 to £10,000 they could even give them a billion cubic feet. One effect of the reduction in the price made last December was that their electrical friends bombarded—if he might use the word—the residents with pamphlets containing all sorts of statements, and giving illustrations of the dreadful results of fires caused by gas. Well, he had no doubt that, so far as the Company were concerned, they could hold their own against statements of this nature. They pointed out the tendency of gas to encourage fires; but, as a matter of fact, a report recently submitted to the Fire Brigade Committee of the London County Council showed that, in proportion to the number of consumers, where one fire was caused by gas, two fires were caused by electricity. This report, coming as it did from an independent body, should have more weight with reasonable people than any number of prejudiced statements. A great deal was heard about corporations taking over gas and electricity supply companies; but his opinion was that, in the interests of the stockholders and gas consumers alike, it was much better that such companies should not be in the hands of corporations. There was continuity of policy and in working among the directors of a company which was not found in the ever-changing constitution of corporations, and which tended to successful management. He read recently that the Bath Corporation had been recommended to sell their electricity undertaking, which they acquired from a Company fifteen years ago. This was an example of corporation management of electricity. Supposing the Reading Gas-Works were in the hands of the Corporation, and they had earned the profits made during the past year, would the gas consumer get the benefit? He was afraid not. They would go to the relief of the rates. At the present time, the Directors had secured the stockholders' interests up to the hilt; and all the profits now would go to reduce the price to the lowest possible limit, and thereby benefit the gas consumers. They were still extending the mains; and as the outlying districts of Reading became populous, they were always ready to lay mains there. As the consumption of gas increased in these districts, it would tend to keep down the price in Reading. In conclusion, he could only express the hope that the Company would continue to go forward. A word should be said with reference to the staff. As evidence of the satisfactory work performed by the Engineer and his staff, he need only refer to the most satisfactory results they had obtained. Mr. Helps was ever on the look-out for improvements which he could effect in the working; and the successful results obtained reflected the greatest credit upon him. With regard to the secretarial staff, they had in Mr. Williams a very careful, methodical—in fact, excellent man. He could not speak too highly either of the Engineer or Secretary; and he was sure the shareholders could place the greatest confidence in them.

The Vice-Chairman (Mr. H. B. Blandy, J.P.), in seconding the motion, mentioned, in connection with the reduction in the price of gas, that the Company have about 7000 penny and 1200 shilling slot-meter consumers, and said the reduction made amounted to slightly more in these cases than to the ordinary consumers. But he thought it was desirable to encourage as much as possible the slot consumers, especially the penny ones, who belonged to the poorer class. There was one feature of their Engineer's successful management which he should like to mention, and that was the large decrease which was shown in the unaccounted-for gas. During the year 1905 this amounted to 6·5 per cent.; but in the past year it was reduced to 4·24 per cent. This was a most satisfactory state of affairs, seeing that the Company had some 93 miles of main; and he thought the Engineer deserved great praise.

The motion was carried unanimously.

The retiring Directors and Auditor having been re-elected, a vote of thanks was accorded to the staff.

Mr. Helps, in acknowledging it, said the Company had now a very contented body of workpeople. The introduction of labour-saving machinery, where it relieved the workmen of the most arduous portion of their duties, greatly increased the responsibility of the staff; and therefore he should like to bear testimony to the great assistance he had received, both on the works (from Mr. Baker downwards) and in the district. The Chairman had referred to the additional consumption of gas, which amounted to 5·77 per cent.; and when it was borne in mind that incandescent lighting was being very generally adopted—and this meant, of course, a diminished consumption per burner—he thought the proprietors would recognize that there had been a very satisfactory increase. They had recently installed incandescent burners in All Saints' Church; and he found that the consumption for the past quarter was 19,100 cubic feet, compared with 47,000 cubic feet, or a reduction of 55 per cent. on the average for the corresponding quarter for the three previous years, while they had four or five times as much light as before.

Mr. Williams, in returning thanks on behalf of his staff, quoted some interesting figures in connection with the work of the prepayment department.

The ordinary meeting closed with a vote of thanks to the Chairman.

An extraordinary general meeting was then held, at which the Directors obtained the sanction of the proprietors to raise, as required, £25,000 of the remaining capital authorized by the Company's Act of 1902.

SOUTH STAFFORDSHIRE MOND GAS COMPANY.

A Heavy Loss.

The Sixth Ordinary Meeting of the Company was held on Monday of last week, at the works, Dudley Port—under the presidency of Mr. G. Macpherson, the Chairman.

The report for the twelve months to Dec. 31 stated that the works had been in continuous operation during the whole of the year, and gas of regular quality had been constantly supplied. The output had been, however, only a little more than half the capacity of the plant. Practical demonstrations of the application of the gas for furnace work had been given at the works from time to time; and many manufacturers in the district had attended. Every endeavour had been made to induce them to adopt the gas for heating purposes, as well as for power. Arrangements had been made to build an annealing furnace at a works in Walsall; and negotiations were in progress with several firms for building furnaces at their works. During the year, orders had been secured for 22 installations—one at a large-tube works and nine to replace existing gas plants. Gas was not yet being supplied to seven of the installations referred to, as the engines and furnaces were not ready. Gas was being supplied at the end of January to 24 customers—apart from that delivered to the South Staffordshire Mines Drainage Board. The whole of the debenture stock offered for subscription in August last (£55,000) had been taken up. The loss on revenue account for the past year was £13,677. The Board regretted this loss, which they feared must continue until more customers were obtained. The Directors had again decided to forego their fees and travelling expenses for the year.

The Chairman, in moving the adoption of the report and balance-sheet, said frankly that the Directors were grievously disappointed with the result of the year's work. The adverse result was simply due to the fact that the manufacturers of the district had not shown that willingness to avail themselves of the advantages and economies that could be given them which would have been expected from business men. As an instance of the saving which had been made at one works by using Mond gas, he would give some figures from the manager of the works to his chief, which that gentleman had kindly placed at their disposal. In this instance, they replaced a steam-engine. The cost of fuel alone for raising steam for 6½ weeks previous to the putting in of the gas-engine was £29 18s. 11d.; the cost of the Mond gas for the following six weeks was £14 1s. 10d. The cost of power at these works was therefore reduced nearly 50 per cent.; and the report said: "In addition, we have no expense of slack unloading, ashes removal, or water, and a decreased cost of engineman's wages." Very similar results had been obtained at every works where Mond gas had been installed. The Company had had to erect furnaces at their own works to demonstrate to manufacturers that they could do what they claimed. One of the furnaces they had erected was for dealing with a large trade in the district—annealing. Though they had annealed several tons of castings for various firms satisfactorily, it was only within the last month or so that they had been able to arrange with a firm to put up a furnace at their own works. They were negotiating with other large firms—consumers of fuel for both power and heating purposes—and the shareholders might rely upon their doing all they could to induce these firms to take the gas. Now that the price of fuel was going up by leaps and bounds, manufacturers might be more inclined to allow them to cut down their costs, and at the same time to reduce the Company's loss. Their loss was due mainly to so small a proportion of the gas being sold to ordinary customers. If all the gas had been sold at the average price received for that supplied to ordinary customers, their income would have been increased by nearly £11,000, and their loss reduced to about £4000. With the present plant, they could easily make double the quantity of gas. If this had been done, and they could have sold it at their present average price to outside customers, there would have been a profit.

The report was adopted, after some discussion.

Sales of Shares.—At a recent sale by auction, £50 of Pudsey Gas Company's stock was disposed of at the rate of £213 10s. per cent. Twenty-two shares of £5 each in the Garforth Gas Company sold at £6 17s. 6d. each; while among the lots which changed hands privately before the sale were some Castleford and Whitwood Gas Company's shares, at £22 2s. 6d. and £22 12s. 6d. each. At a sale at Littlehampton last Tuesday, two £100 mortgage debenture bonds in the Arundel Gas Company, paying 3¼ per cent., fetched £88 each; while eleven £10 consolidated ordinary shares realized par value.

PROVINCIAL GAS COMPANIES.

Satisfactory Progress at Aldershot.

Mr. A. F. Wilson, the Chairman of the Aldershot Gas and Water Company, had a good report to ask the proprietors to adopt at the recent half-yearly meeting. The revenue in the six months ending Dec. 31 was £29,268, and the expenditure £22,199; leaving a surplus of £7069. The balance available for distribution was £8826; and the Directors recommended a dividend at the rate of £11 19s. per cent. per annum on the "B" shares, and £7 per cent. per annum on the ordinary "E," "F," and "G" shares, for the half year; also a dividend at the rate of 3s. per cent. per annum on the "A" and "B" shares for the first half of 1906—all being less income-tax. In moving the adoption of the report, the Chairman said that in revenue and expenditure they were still upon progressive and satisfactory lines. In gas, for example, they had a revenue of £17,425 for the half year, against £16,892 for the corresponding period of 1905. To this they must add 1d. per 1000 cubic feet, the amount of the reduction to the ordinary and slot-meter consumers, which would have increased the surplus by quite £400. From residual products they had £6197, whereas last year the amount was £5202. By the sale of water they had £5110, against £4799 in the corresponding half of last year—the increase being fully £300. These were the main items of revenue; and on the expenditure side there were some very satisfactory figures. This being the completion of his 25th year as Chairman of the Company, he thought some comparisons would be interesting. In 1882, the Company sold 25,335,800 cubic feet of gas. In the past year, including the outside districts, they sold 231,316,800 cubic feet, or about nine times as much. In 1882, the revenue from gas alone was £5695, at 4s. 6d. per 1000 cubic feet. Last year it was £32,554, at 2s. 7d. So that they had reduced the price of gas 47 per cent., so to speak, and they had increased the revenue six times, or, at the price charged in 1882, twelve times. The gross revenue of the Company was £9153 in 1882, whereas last year it was approximately £55,000. He concluded by pointing out how advantageous the prosperity of the Company had been to the town. The report was adopted, and the dividends recommended were declared. In acknowledging a vote of thanks which included the staff, the Secretary and General Manager (Mr. R. W. Edwards) said he was well supported by thoroughly good men in every department of the works; and the whole of the employees tried to do their best for the benefit of the Company, the shareholders, and the consumers.

Enlargements and Improvements at Chichester.

The report of the Directors of the City of Chichester Gas Company for the half year to Dec. 31 referred to the alterations, enlargements, and improvements of the works which were noticed in last week's "JOURNAL" (p. 541), and stated that the Company were now in a position, not only to effect economies in the manufacture of gas, but to give an abundant supply. The balance standing to the credit of net revenue, after providing for interest on mortgage bonds, debenture stock, and temporary loans, amounted to £2028, out of which the Directors recommended a dividend for the six months at the rate of 10 per cent. per annum on the "A" capital stock, and 7 per cent. per annum on the "B" and "C" capital stocks—all less income-tax. In presenting the report to the meeting of shareholders, the Chairman (Mr. Alfred Lass) pointed out that the heavy capital expenditure recently incurred necessitated the raising of further money. The capital employed per ton of coal carbonized at Chichester, however (£7 17s. 5d.), was considerably below the general average of £8 11s. 6d. for companies and local authorities shown by the parliamentary returns. In addition to this, it was estimated that with a very small future expenditure on capital account, the Company's works, plant, and machinery would be sufficiently large to meet the growing demand for gas for some few years to come. In 1896, the gas made was 38,375,000 cubic feet, and in 1906 it was 62,400,000 cubic feet—being an increase in the ten years of 24,025,000 feet, or at the rate of 5 per cent. per annum compound. In other words, the make of gas would be doubled in fourteen years. There was every reason to believe this rate of increase would be in the future fully maintained. He was sure the shareholders would agree with the Board that the new works were well designed and substantially erected, and reflected great credit on the Company's Engineer, Mr. T. E. Pye, as well as on Messrs. S. Cutler and Sons, of Millwall, and Messrs. J. G. Holt and Sons, of Chichester. The make of gas per ton in 1905 was 9421 cubic feet, and in 1906 it was 10,866 cubic feet. In the same period, the unaccounted-for gas had been reduced from 10·25 per cent. to 7·07 per cent.; while the amount realized from the sale of gas was £4810 in 1905 and £4926 in 1906. The increased quantity of gas sold had thus resulted in an additional revenue of £96, notwithstanding the fact that the price had during the past half year been reduced 1d. per 1000 cubic feet—from 3s. 4d. to 3s. 3d. Looking at the accounts generally, they might upon the whole be considered satisfactory; and with reference to the future, it was fully anticipated that further economies would be effected which, with the normal growth of the Company's business, ought to result in continuous prosperity—unless there was an abnormal rise in the price of coal, material, and labour. Up to the present time, no organized effort had been made to popularize the use of gas for lighting, cooking, and heating purposes; and it was believed that a large field still remained undeveloped. To promote this desirable object, the Directors had arranged for an exhibition of gas appliances.

Effect of Incandescent Burners in Cork.

During the past half year, the Cork Gas Consumers' Company have experienced an increase in the number of consumers, with a slight falling off in the consumption of gas. This, explained the Chairman (Mr. George Lynch) at the meeting, was due partly to the mild weather that prevailed at the close of the half year, and partly to the increase in the use of incandescent burners, which, of course, gave a larger amount of light for a smaller consumption of gas. In order to trace the cause of the falling off, some hundreds of accounts were examined; and it was found that, owing to the use of the incandescent burner, there was an average decrease per consumer of 22 per cent. However, the Directors welcomed all improvements that would tend to further establish, from an economical point of view, the superiority of gas as an illuminant over all its competitors. The balance of profit and loss was £5842, out of which a dividend was declared at the rate of 8 per cent. per annum, which would amount to £5555, and leave £287 to be added to the reserve fund.

Extended Area and Continued Growth at Eastbourne.

In moving the adoption of the report at the half-yearly meeting of the Eastbourne Gas Company on Monday last week, the veteran Chairman (Dr. G. A. Jeffery, J.P.), who has held the office for about 47 years out of the half-century during which he has been a Director, followed his usual custom of giving shareholders a few figures explanatory of the accounts and of the Company's trading during the six months covered by them. He said the capital now expended amounted to £178,617, which was equal to £454 per million cubic feet of gas on the sale in the past year of 393 millions—an improvement of £19 per million cubic feet, in spite of nine miles of new mains laid to the new district of Hampden Park and Willingdon. The sale of gas had gone up from 195,995,000 cubic feet in the second half of 1905 to 207,336,000 cubic feet in the corresponding period of 1906—an increase of 11,341,000 cubic feet, or 5¾ per cent. This was very satisfactory indeed, more especially as the weather was fine and warm nearly up to Christmas. The number of consumers was as follows: Private consumers, ordinary meters, 4304; coin meters, 3878—total, 8182. Number of public lamps, 1333; and stoves on hire, 5667—a gain in the year of 432. The leakage, which was always a small matter, was a little lower; being 5 per cent., against 5·8 per cent. The net profit was £8680, against £8396. This was £683 more than the dividends of the Company upon the advanced scale, and was only taken after every due provision had been made in respect of the upkeep of the works, mains, and depreciation. Coals and gas-making materials had cost £13,293, against £12,487 in the corresponding half year—being an increase of £806, the coal having cost 15s. 10¾d. against 15s. 8d. per ton. Residuals had produced £6234, against £6136, or a gain of £98. Rates and taxes had amounted to £1321, as compared with £1422, or a reduction of £101. The receipts for gas and the rents of meters, stoves, &c., on the diminished price of gas were £30,799, against £29,050—an advance of £1749. The coke produced was 9 99 cwt. per ton of coal, against 9·85 cwt. in the corresponding period of 1905; the tar made was 12·2 gallons against 11 gallons per ton; while sulphate was 20·5 lbs., against 21·2 lbs. per ton. The gas made per ton of coal was 11,000 cubic feet, as before; and the gas made from oil was 468 cubic feet per gallon, against 460 cubic feet, or an increase of 2 per cent. The history, then, of the past six months was the continued advance in the growth of their prosperous Company. Their business in Eastbourne had steadily increased, representing nearly 6 per cent. in the half year. Dr. Jeffery concluded with some pertinent remarks on the subject of increased rates which have to be borne by companies and others owing to the extravagance of local authorities; and he urged the shareholders to support only municipal candidates who would pledge themselves to keep down the rates to the lowest point consistent with efficiency. He noticed from a newspaper paragraph that at Eye, in Suffolk, the last payment had been made of the borrowed money, which placed the Corporation in the exceptional position of being free from debt. This was described as "a condition of things of which no other corporation in England could boast." It was what he considered to be a Twentieth Century miracle. He would have this paragraph placed over the portals of every town hall in England, as a wholesome example to the authorities in the way of economical control. Alderman Towner seconded the motion; and it was carried unanimously. Dividends at the rates of 15 and 12 per cent. per annum having been declared out of the £24,735 available for distribution (leaving a balance of £16,898 to be carried forward), a vote of thanks was accorded to the Directors, officers, and workmen, on the motion of Mr. Oke, seconded by Mr. C. E. Botley, for the care with which they had conducted the business of the Company, as shown in the accounts, and by the growth and progress made. The Chairman having acknowledged the vote, special meetings were held at which the Directors were authorized to raise additional capital to the amount of £40,798, in £10 shares, and to proceed, in conjunction with other gas companies, with the Bill now before Parliament for the removal of sulphur restrictions. The proceedings closed with a vote of thanks to Dr. Jeffery for presiding.

A Public Lighting Offer at Elland.

A considerable portion of the speech of the Chairman (the Rev. G. E. Aspinall) at the annual meeting of the Elland Gas Company was on the subject of public lighting. He said they had gone to Barkisland, which was not in their area, to supply gas at the request of the District Council, with whom they had entered into a satisfactory agreement for public lighting. This had been already installed, except a few extensions which would be made in the coming summer. He had had the opportunity of inspecting the district, and could confidently say that no part of their area, or, indeed, any rural district which he ever saw, was so efficiently lighted. The lamps were all incandescent, and the lighting arrangements were under their own control; and he thought they might point to this district as an object-lesson to other places where people were still walking in darkness, or where the lighting was inefficient, though the cost might be greater. In this connection, he might be permitted to say that, as regarded public lighting, the Company were prepared to erect lamp-posts, lamps, &c., and light, extinguish, and maintain the same, for the sum of ¼d. per lighting hour per annum, subject only to the lamps not being more than 80 yards apart and being lighted for a minimum of 2500 hours per year. The total number of lighting hours in a year between sunset and sunrise was 4300. Leaving off lighting during May, June, and July, and three nights before and two nights after each full moon, this total could be reduced to 2500 hours, as suggested. Passing to the accounts, he said the net result of the year's work was that the preferential dividends and statutory dividends and interest on loans had been paid, the reserve fund had been increased by £165, and the insurance fund by £254. In regard to the future, the year had opened well. In the Barkisland district a ready response was made by the residents to their canvassers, so that almost all were now supplied, or would be very

shortly—giving them nearly 200 new consumers, in addition to 88 public lamps. The report was adopted; and the Chairman, Engineer (Mr. Robert Porter), and staff were thanked for their services.

Reduced Prices and Larger Business at Exeter.

In his address to the shareholders of the Exeter Gas Company, at their recent meeting, Mr. G. Hardy Harris congratulated them upon the fact that, in spite of the competition of electricity, the business of the Company continues to grow. During the past year, the number of slot-meter consumers has increased by 721; while an addition of 434, or 10 per cent., has been made to the number of cooking-stoves on hire. No doubt some portion of this increased business is due to the policy of the Directors in reducing the price of gas. In 1905, an all-round reduction of 1d. per 1000 cubic feet was made to ordinary consumers; while last year the users of slot-meters were encouraged by an increase in the quantity of gas given for 1d. The Directors have also adopted the plan of allowing discounts varying from 5 to 10 per cent., according to consumption, for prompt payment of accounts. Another thing for which gratification was expressed in the report was the maintenance of the illuminating power of the gas at considerably above the legal standard; and the Chairman naturally took credit for the fact that, both in efficiency and economy, the light supplied by the Company is superior to the electric light. In this connection, he referred to the successful experiments which have been carried out during the year of lighting St. James's Church and the parish church at Heavitree. There has been an increase of public lighting in consequence of an extension of the mains to Heavitree; and Mr. Harris announced that this policy of extension in the suburbs is to be continued by large mains to Ide and Alphrington. In regard to the high price of coal, shareholders were informed that the Company would not at present be affected, as contracts were made before the advance took place. The detailed particulars of the Company's business given in the report showed that the sales of gas had increased during the past year by more than $2\frac{3}{4}$ million cubic feet, and the income from residuals showed a considerable increase over 1905. The report was adopted, and the full dividends were declared. Of the balance, £250 was carried to the insurance fund, and the remainder to the reserve fund.

A Successful and Profitable Year at Harrogate.

The annual meeting of the Harrogate Gas Company was held last Wednesday. In the absence of the Chairman (Mr. S. Hornby), Mr. F. Barber presided. The report and accounts for the past year showed a revenue of £46,719 and an expenditure of £31,536; leaving £15,183 to be carried to the net revenue account. The make of gas last year was 274,714,600 cubic feet, of which 120,997,600 cubic feet were sold through ordinary meters, 84,784,300 cubic feet through stoves, &c., 3,304,100 cubic feet through weekly meters, 38,503,200 cubic feet through prepayment meters, and 9,862,300 cubic feet for the public lighting; making a total of 257,451,500 cubic feet. In moving the adoption of the report, the Chairman congratulated the proprietors on the sound condition of the undertaking and upon another successful and profitable year's working to the 31st of December last. He referred to the great economies effected by consumers by the adoption of incandescent methods of gas lighting, whereby their consumption in many cases had been reduced by 50 per cent., with the advantage of a much better light. As an illustration of the great change which had taken place in this respect, he cited the case of the public lighting, showing that while in 1900 the 1048 public-lamps in use consumed 10,993,300 cubic feet of gas, last year 1575 lamps consumed only 9,862,300 cubic feet. Notwithstanding these reduced consumptions, the total sales of gas in 1906 exceeded those of 1905 by 8,992,500 cubic feet. A resolution declaring dividends 1 per cent. less than the prescribed rates was passed, and 1 per cent. was carried to the reserve fund. The thanks of the proprietors accorded to the Chairman, Directors, and staff concluded the meeting.

Gas Supply in North London Suburbs.

If any evidence were required of the extended use of gas in the northern suburbs of London, it would be found in the reports of the North Middlesex and Southgate Gas Companies for the six months to Dec. 31 last, presented at their recent half-yearly meetings. The former Company had an increase of 6·8 per cent., and the latter of 5·9 per cent., compared with the corresponding period of 1905. Both Companies paid maximum dividends for the half year, and are going to raise more capital in order to extend their works and plant.

A Satisfactory Report at Margate.

Presiding at the annual meeting of the Isle of Thanet Gas Company, Mr. Lazarus Hart, J.P., the Chairman, congratulated the shareholders upon the very satisfactory condition of the Company's affairs, particularly with regard to the working of the past year. The results, he said, were only achieved through extreme care being exercised by the Directors and the officials. The sales of gas had increased by some 5 million cubic feet over the previous year. In the manufacturing department, the cost had been reduced in every item, and the revenue increased—this applying more particularly to the yield of gas per ton of coal carbonized, which had risen from 11,197 to 11,400 cubic feet. The sales per ton had increased from 10,126 to 10,430 cubic feet; while the unaccounted-for gas had been considerably reduced. The sales of residuals had realized more per ton; and one of the most satisfactory features of the report of the Engineer (Mr. Frank A. Winstanley) was that the yield of sulphate of ammonia showed an increase over the previous year of more than £800. This was chiefly due to the erection of a new washer-scrubber, which had in every way come up to expectations. It was confidently expected that the results in this department during the current year would be even better than those of the year just closed. Owing to numerous complaints having been received from consumers regarding an insufficient supply of gas, new mains, varying in size from 16 to 6 inches, had been laid in the Cliftonville and New Town districts; and the result had been satisfactory to the consumers and the Company alike. Regarding the public lighting of the town, it was extremely gratifying to know that the Corporation were well pleased with the Company's efforts; and the report of the Borough Lighting Inspector to the Town Council was very satisfactory. So that under this head there was every prospect of gas still holding sway, especially when the cost and efficiency were compared with electricity. Referring to the increase in the price of coal, he did not anticipate that there would be any necessity to increase the charge for gas; and he thought the shareholders need not be anxious in the matter. The report and accounts were unanimously adopted.

Continued Prosperity at Portsmouth.

The accounts of the Portsea Island Gas Company for the six months ending Dec. 31 last, which were presented at the recent half-yearly meeting, showed that the revenue had amounted to £105,700, compared with £102,560 in the corresponding period of the previous year; while the expenditure of £86,537 permitted £19,163 to be carried to the profit and loss account. Exclusive of the amount standing to the credit of the extraordinary renewals account (£15,588), the first-named account showed an available balance of £44,268. This enabled the Directors to recommend dividends at the rates of 13 per cent. on the "A" and "B" shares, 12 per cent. on the "C" shares, 10 per cent. on the "D" and "E" shares, and 5 per cent. on the stock, less income-tax, leaving a balance of £26,336 to be carried forward. The consumption of coal at the works in the half year had been 50,970 tons, and of oil 531,135 gallons; while the gas manufactured had been 673,443,000 cubic feet—the latter being an increase on the corresponding period from 665,346,000 cubic feet. The gas sold was 625,110,100 cubic feet, against 617,176,000 cubic feet. The Chairman (Sir John Baker, J.P., M.P.) congratulated the proprietors on the continued prosperity of the Company, which was, he said, largely due to the development of the borough and the requirements of the increased population, to supply which the new works were quite adequate. The report was a continuous example of the stability of the undertaking; the past half year showing a clear increase of £2000 in the profits. In conclusion, he highly praised the services of the Engineer and General Manager (Mr. J. D. Ashworth) and also of the Secretary (Mr. H. A. Stibbs). The motion was carried unanimously. The usual complimentary votes were passed and duly acknowledged.

Continued Success and Reduced Price at Tunbridge Wells.

Two very satisfactory features characterized the annual meeting of the Tunbridge Wells Gas Company last Tuesday. There was an increased sale of gas to the extent of $3\frac{1}{2}$ per cent. in the past year as compared with 1905, and the Directors announced a reduction of 2d. per 1000 cubic feet in the price of gas as from Christmas last—making it 2s. 8d. within the borough. There was a sum of £18,726 available for distribution; and the Directors recommended dividends for the second half of the year (interim dividends having been paid) at the rates of 12, $9\frac{1}{2}$, and 9 per cent. per annum on the several classes of stock. This would absorb £5529, after deduction of income-tax, and leave £13,197 to be carried forward. The Chairman (Mr. W. H. Delves), in moving the adoption of the report, said though it was short he could assure the shareholders that the business of the Company during the past year had not only been satisfactory, but had increased. The number of consumers had augmented by 275; and considering that the Company had been in existence a good many years, he thought this was very good. The number of stoves had not gone up so much as usual; but 200 had been put in during the year. The town was now pretty well provided with them; and it could not be expected that the increase would go on as it had done during past years. The Directors, however, thought that the time had come to make a little further stir in the matter; and they had arranged with two of the leading firms supplying stoves to send down and see if they could not stir up the people to use a little more gas, in view of its cheapness. Turning to the accounts, they would find that the capital account had been increased by only £458. It was a curious thing that in the last four years the addition had only been £1614, and the increase in the quantity of gas made had been 28 millions. This was a very satisfactory position for the Company. Passing to the revenue account, the Chairman went through it in detail, and stated that the increased profit on the year's working, compared with 1905, was £1257. The proprietors would therefore see that the result of the year's business had been exceedingly satisfactory. Referring to the reduction in price, he acknowledged that it was a bold step to take; but the Directors felt—and he was sure rightly—that the sheet-anchor of a gas company was cheap gas. The cheaper they could sell it the better it would be for them, and the more stable the concern would be. The reduction would make a difference of £2250 in the revenue of the Company; but this amount would remain in the pockets of the consumers, and he hoped would fructify there. With regard to the proprietors, their dividends would go up $\frac{1}{2}$ per cent., which would mean £605; so that the loss to the Company would be £2858. But they expected to save £2900 on the year; and therefore they were abundantly justified in lowering the price. Mr. A. W. Oke seconded the motion, and it was carried. Then the retiring Directors and Auditor having been re-elected, the Chairman proposed that a cordial vote of thanks be passed to Messrs. Stone, Simpson, and Mason (the Solicitors), Mr. Andrew Dougall (the Engineer and General Manager), Mr. C. F. Catt (the Accountant and Secretary), and other officials, for the very satisfactory manner in which they had performed their duties during the past year. He could only say that the whole of the staff, from Mr. Dougall down to the youngest member, exerted themselves thoroughly for the good of the Company. He might mention that the production of gas per ton of coal had increased by 120 cubic feet. The motion having been carried, Mr. Dougall, in reply, said they had tried to put their hearts and brains into their work; and they were glad to know that it met with the proprietors' approval. Mr. Catt also replied, and said it was a pleasure, not only to himself but to the whole staff of clerks and collectors, to carry out the work of the Company; and he was glad to see it going on satisfactorily. A vote of thanks was passed to the Chairman, and the proceedings closed.

Fresh Capital at Tynemouth.

Though the percentage increase in the make of gas was not so large as in recent years, the past twelve months' business was satisfactory for the Tynemouth Gas Company. In proof of this, the

Chairman (Mr. J. B. Williamson, J.P.) said the number of new consumers, ordinary and automatic, added during the year was 672, and in addition, the Company had fixed 545 cooking-stoves, besides a large number of heating-stoves and other gas appliances. The work in the retort-house was again excellent; 40,211 tons of coal having been carbonized, producing 437,652,000 cubic feet of gas. This was an increase on the previous year of over 500,000 cubic feet, though 1619 tons less coal had been used. The make of gas per ton was the highest recorded in the history of the Company. The revenue from gas was slightly less than in the previous year, due to the reduction of 1d. per 1000 cubic feet over the entire lighting area. This reduction brought gas down to the low price of 2s. per 1000 feet, less the usual discounts, ranging from 5 per cent. to 20 per cent., according to consumption. The total receipts from residuals amounted to 92 per cent. of the cost of coal. The net profit on the year's work was £9916, and was disposed of as follows: In meeting the statutory dividend of 4 per cent. on the preference stock, and of 5 per cent. on the ordinary stock, £9561; carrying forward a balance of £355. This, added to the accumulated undivided profit of previous years, left £10,150. They proposed to take £2000 of this sum, and add it to the reserve fund, bringing it up to £14,947, and to carry forward £8150 to next year. The Directors, at the request of the Earsdon Urban District Council, were arranging to supply gas to Earsdon, Shiremoor, Backworth, and other villages; and the laying of trunk mains was already in hand. It had been necessary to charge a somewhat higher price than in the borough; but it would still be low, compared with prices usually charged in similar outlying districts. This would add over 1000 new consumers. For the purpose of the proposed extensions, and for meeting the ordinary expenditure, more capital was required; and the shareholders were subsequently asked to authorize the raising of further capital to the extent of £30,000. This they did; and they approved of the promotion of the Removal of Sulphur Restrictions Bill by their own and six other companies.

Sound Position and Steady Progress at Weymouth.

In the report presented at the recent half-yearly meeting of the Weymouth Consumers' Gas Company, the Directors stated that the accounts for the six months ending Dec. 31 last bore evidence of the sound position and steady progress of the Company's business; the quantity of gas sold in the period named having been 3,383,100 cubic feet, or 6·1 per cent., more than in the second half of 1905. The revenue amounted to £12,750, and the expenditure to £9859; leaving a balance of £2391. A sum of £4879 was available for distribution; and the Directors recommended the declaration of a dividend at the maximum rate of 5 per cent, less income-tax. In moving the adoption of the report, the Chairman (Mr. J. E. Robens) said the Company had had a very successful career during the past year. There had been an increase of 3,383,100 cubic feet of gas in the six months ending December, and in the first half of the year an increase of 2,989,500 cubic feet; so that their total for the year was 6,372,600 cubic feet. The quantity of gas sold last year was nearly 106 million cubic feet. The year just ended was the fortieth of their existence; and he thought that when they looked back at what had been done during these years they could not but be grateful that their position was what it now was. When the Company was formed, 20 millions was the quantity of gas sold. Then the price was 5s. 6d. per 1000 feet. Now they had it at 3s. 2d.; and he was pleased to add that the Directors, finding themselves in such a favourable position, were able to announce that after March 31 the gas in the town would be charged at 3s. per 1000 cubic feet. The Chairman spoke highly of the services of the former Engineer and Manager, Mr. James Lowe (who was present), and of his successor, Mr. D. F. Colson. It was due, he said, largely to Mr. Lowe's careful management that the concern was in its present prosperous position; and Mr. Colson was honourably following in his footsteps. The report and accounts were adopted, and the dividend recommended was declared. The Chairman, Directors, and staff having been thanked for their services, Mr. Colson said he was sure it must be most gratifying to all of them, after another six months' fight with the electric light, to see that they were able to show such an increase in the consumption of gas. The Secretary (Mr. E. Y. Wood) added that it was a source of pleasure to the whole of the staff to be able to render so good an account every six months as they had been able to do during the past few years. At the close of the ordinary business, a special meeting was held at which the proprietors sanctioned the promotion, in conjunction with other gas companies, of the Gas Companies (Removal of Sulphur Restrictions) Bill.

Increased Use of Slot Meters and Cookers at Wolverhampton.

At the meeting of the Wolverhampton Gas Company last Tuesday, the Chairman (Mr. B. O. Clark), in moving the adoption of the report, congratulated the shareholders on its satisfactory character. He said there had been an increase of about £100, notwithstanding that coal had been a little dearer. At present they were making more gas, because people were using more on account of the cookers and prepayment meters that were being put in. The report was adopted, and dividends were declared at the same rates as for the previous half year —viz., 3 per cent. upon the preference stock, £5 2s. 6d. per cent. upon the consolidated stock, and £3 2s. 6d. per cent. upon the new ordinary stock, less income-tax; and the balance of undivided profits (£459) was carried to the reserve fund. As bearing out the Chairman's statement, the Engineer and Manager (Mr. W. G. Winstanley) gave some interesting figures. He said there was an increase of 21 per cent. in the slot consumers in the past year. At present 7323 meters were at work—an increase of 1267. This showed that the demand for gas among the working classes was by no means falling off, but tended to increase. At the same time they had 1267 additional slot meters in use, and had also fixed 1332 cookers. During the year they had fixed 228 additional ordinary cookers—an increase of 10¼ per cent. on the total number in use, which was satisfactory when they considered that these were bought. Eight additional gas-engines had been supplied; and, in spite of the competition of the Corporation in the matter of electric light, they had 36 more public-lamps in use than last year. The gas used for engines and general trade purposes showed an increase of 12½ millions during the year, and for slot-meter cookers an increase of nearly 12 millions.

METROPOLITAN GAS COMPANY OF MELBOURNE.

The Half-Yearly Meeting of this Company was held at the Offices in Melbourne on Jan. 26—under the presidency of Mr. JOHN GRICE, the Chairman.

The report stated that the net profit for the half year to Dec. 31, including a balance of £2321 brought forward, amounted to £59,810. This the Directors recommended should be disposed of as follows: Reserve fund, £10,000; meter renewal fund, £3000; gas-stoves, &c., account, £1500; and a dividend at the rate of 5s. per share, £42,860. This would leave a balance of £2450 to be carried forward. Mr. R. O. Thompson, after 28 years' continuous service with the Company, had resigned his position as Engineer, and had been appointed Consulting Engineer. Mr. P. C. Holmes Hunt, who had been on the staff some years as Assistant Engineer, was appointed to fill the position of Acting Engineer.

The CHAIRMAN said that the sale of gas for the year 1906 was 1342½ million cubic feet, as compared with 1268 millions in 1905—an increase of 74½ millions, or nearly 6 per cent. This increase in sales had been helped by the cool weather which had characterized the year. It was the largest increase in any one year for sixteen years; and the output had for the first time since 1894 passed the consumption that year. The number of ordinary meters, exclusive of public lamps, showed an increase during the year of 3086, and now stood at £64,484; and the number of slot meters, an increase of 2576—now standing at 4727. He had no hesitation in predicting that the slot meters would show a still greater increase during 1907. The Directors having now had two years' experience of their returns from these meters, were satisfied it would pay the Company to largely increase their issue. To show the progress of incandescent lighting, it might be stated that through the Company's sales-room—representing only a part of the total sales in Melbourne—10,100 burners and 123,157 mantles were disposed of in 1906. It was sometimes contended by competitors—the electric light companies and corporations—that gas companies were not making progress with public lighting and lighting under contract. The answer was that the number of public lamps the Company now supplied was 7529—a greater number than any year since 1892, when the Melbourne Corporation had not taken over the lighting of the streets. Stoves on hire numbered 8943, as compared with 8427 at the end of 1905. The proceeds from sales of gas showed an increase of £8360, and residuals an increased return of £4391. The balance carried to revenue account was £77,262, against £76,286, or an improvement of £976. Many shareholders might justifiably have expected the larger business now reported to show improved profits; and it would have done so, but for the seriously threatened strike among the miners at Newcastle. The position was for a long time a critical one; and at the last moment a prolonged strike was only narrowly averted. In the circumstances, the Directors dared not take any risk of a suspension of the gas supply of Melbourne; and they consequently bought a large quantity of outside coal to provide against such a contingency. This coal cost more than that under contract. He then referred to the smoke nuisance, the use of gas for power, and the stability of gas as an investment. In the latter connection, he quoted the statistics of Herr Schäfer which recently appeared in the "JOURNAL" [Dec. 18, p. 807]. He then moved the adoption of the report and accounts.

Mr. E. J. WHITE seconded the proposal, and it was agreed to.

The dividend recommended was afterwards declared.

AUSTRALIAN GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held at the Royal Exchange, Sydney (N.S.W.), on Jan. 28, under the presidency of Mr. G. J. COHEN, the Chairman.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. This stated that the profits for the half year to Dec. 31, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs, and renewals, depreciation of plant, working expenses, and all other charges, with the balance brought forward, amounted to £72,289. The Directors recommended the payment of a dividend for the six months of 9s. per share on the old shares, and in proportion on the new shares, free of income-tax. This would absorb £59,996, leaving £12,293 to be carried forward to the next account.

The ENGINEER (Mr. T. J. Bush) reported that the whole of the plant was in an efficient condition. During the half year, several important extensions of mains were carried out, to meet the increased demand for gas.

The CHAIRMAN, in moving the adoption of the report and accounts, said it afforded him much pleasure to report that the result of the operations of the Company during the past half year had been of a most satisfactory nature. In the balance-sheet, it had hitherto been the custom to include under the heading of "suspense accounts" the amount of the premium capital; but in future, the shareholders would be able to see this item for themselves. That over £232,000 should have been contributed in this manner, on which no return whatever was received, should at once dispel the idea that the shareholders were striving to get all they possibly could out of the public. When the premium capital was taken into account, the dividend on the original share capital was reduced to 11½ per cent.; while the return on the present price obtainable for the shares, yielded less than 5 per cent. The consumption of gas was steadily increasing; the quantity sold in 1906 having exceeded that of the previous year by nearly 50 million cubic feet. The suburban districts, in particular, were full of activity at the present time, as one of the results, he took it, of the wave of prosperity now passing over the State. In many districts, large extensions of mains and services had had to be made; existing mains being replaced by those of larger capacity. Touching the expenditure side of the accounts, he was sorry he could not speak so hopefully. They had

been favourably situated during the past three years with regard to their coal contract, which expired with the close of the year. The price at present paid for coal was much in advance of the previous year; but he was not without hope that ere long the Northern coal proprietors would see the folly of their attitude towards gas companies, and be a little more reasonable in their demands. He might also mention that, while the Railway Commissioners insisted upon their paying 6s. per ton freight for coal from Lithgow, the rate, if exported, was 4s. 3d.; so that if the Melbourne Gas Company were using Lithgow coal, they would get it at 1s. 9d. per ton less than his Company had to pay. The quinquennial assessment of the Company's mains would take place this year; and the amount agreed upon between the City Council and the Company would show a considerable advance for the next five years. This they must bear with the best grace possible, as one result of the Company's progress. But what he did think unfair was that their competitors in public lighting—the City Council—were not called upon to bear a similar charge. The electric cables were underground all over the city; and if the judgment of the High Court was good in regard to the gas-mains, it should equally apply in the case of the cables. It might be said that, as far as the Council were concerned, it would be simply transferring the amount from one account to another. This might be so; but how could the cost of supplying electricity be correctly ascertained if these and other legitimate charges were omitted? After referring at some length to the great progress of incandescent gas lighting for streets and other purposes, he gave some details of the Company's business for the past six months. There had been a steady demand for public-lamps—of course, for the suburbs only, as the city had now its own system of lighting. The increase had been 154, bringing the total up to 10,535 lamps. The number of gas-cookers sold by the Company to date was 14,612—the increase for the year being 1107. He was not in a position to state the number of cookers of other makes sold by local agents; but a large number were in use, so that cooking by gas was undoubtedly growing in favour. This was amply proved by the encouraging consumption of gas in the daytime—viz., 43·9 per cent. of the total deliveries. The gas-engines in use, according to the Company's latest returns, numbered 758—an increase of 39 since the last meeting. The steady growth in the number of gas consumers was a source of much gratification. There were at present 74,696, an addition of 2564 for the half year—1306 ordinary, and 1258 prepayment. They had increased the length of mains and service-pipes by 57 miles during the six months, making the total mileage of pipes laid 2120.

The DEPUTY-CHAIRMAN (Mr. J. H. Storey) seconded the motion; and it was carried unanimously.

Mr. J. W. WATT moved, and Mr. A. B. CLARKE seconded, a vote of thanks to the Directors and officers for their services during the half year; and in responding, the CHAIRMAN attributed much of the success of the Company to the efficient services rendered by the staff.

GAS EXHIBITION AT CHICHESTER.

As mentioned in the report of the half-yearly meeting which appears under the heading of "Provincial Gas Companies" in this issue, an exhibition of gas appliances for lighting, cooking, and heating was held last week, in the Corn Exchange, under the auspices of the Chichester Gas Company. The opening ceremony was performed on Tuesday afternoon by the Right Worshipful the Mayor of Chichester (Mr. Walter L. Gibbings, J.P.), who was attended by the Mayoress, to whom the two daughters of the Company's Engineer (Mr. T. E. Pye) presented flowers.

There were a large number of exhibits by well-known gas lamp and fittings firms and engineers, among whom may be mentioned Messrs. Pontifex and Co., the Welsbach Incandescent Gaslight Company, the New Inverted Gas-Lamp Company, Messrs. Hands and Co., the Ecliptic Fittings Company, Messrs. George Bray and Co., Messrs. Bland and Co., Messrs. J. & W. B. Smith, the Pneumatic Gas Lighting Company, the Glover and Hands Patent Switch, Messrs. Falk, Stadelmann, and Co., Messrs. Best and Lloyd, the Howellite Burner, the Humphrey Lamp, and the Khoma Lamp Company. There was a fine installation of high-pressure lighting by the James Keith and Blackman Company, Limited, the compressor for which was worked by a Crossley gas-engine. The whole of the cooking, heating, and trade appliances were entrusted to Messrs. Fletcher, Russell, and Co., who had a very fine assortment of goods designed for every conceivable purpose. Mrs. Collins gave a series of lectures on "Gas Cookery;" and Mr. Pye also delivered two lectures on "The Use and Abuse of Coal Gas." Other important features of the exhibition were the co-operation and support given by the local gas-fitting and other tradespeople of the city, who furnished some very effective stands. An "At Home" was held by Mr. and Mrs. Pye every afternoon on the stage (which had been beautifully furnished as a drawing-room) to customers and others desiring information on gas matters. There was a gas-kitchen fully furnished, with a cooker supplied through a slot meter (in which dinners for the staff were cooked daily under the observation of visitors), with laundry and bath appliances adjoining. A nursery was also suitably fitted up, and most prettily furnished, and provided with toys; while another room was similarly fitted up as a sitting-room. A gas-cookery competition was organized, chiefly for the working classes.

Other interesting items included exhibits of gas-meters (with glass panels) and other goods by the Gas-Meter Company, a portable photometer by Messrs. Alexander Wright and Co., and a collection of rare earths used in incandescent mantle making, and mantles in various stages of manufacture, with "Ino" burners and mantles, by the United Chemical Works. There were two collections of products from gas-coal tar lent by Mr. T. H. Harvey, of Portsmouth, and by Messrs. Forbes, Abbott, and Lennard, as well as a practical working model of a gas-works (constructed to scale) lent by Mr. Pye, and used by him at the lectures, and a slot-meter installation. During the week, Mr. Pye lectured to the Senior Classes of the College and the Pupil Teacher's Centre; prizes being offered for the best essays sent in by the students following upon the lectures.

A unique feature of the arrangements for the week, and one which gave rise to enthusiasm in the city, was the closing up of the exhibition with a Saturday-night popular entertainment, for which a charge for admission was made, and the whole proceeds of which will be given to the local Infirmary. The hall was crowded throughout the week; and the exhibition is to be followed by persistent canvassing and a series of homely demonstrations to be held at fortnightly intervals in the various districts of the city.

BATH ELECTRICITY WORKS TO BE SOLD.

At a Special Meeting, the Bath City Council have decided, by 41 votes to 2, to adopt the recommendation of the Electric Lighting Committee (as recorded in last week's "JOURNAL," p. 556) to sell their electricity undertaking to the Somerset Power Company.

The resolution to this effect was moved by Mr. H. T. Hatt, the Chairman of the Committee, who said they would be the first city in the United Kingdom that had ever taken a step of this kind. There were, however, local considerations which convinced them that a Company would be in a position to supply the current at a cheaper rate sooner than the Corporation. He wished to dissociate himself altogether from the gloomy forecast which had appeared in the Press, supposing they retained the ownership of the concern. The undertaking remained theirs until the whole of the transaction was completed; until the £160,000 was paid into the coffers of the Corporation, they were owners of the works. Whether they remained the property of the Corporation, or whether they passed into the hands of the Company, neither could benefit by gloomy forecasts such as those they had seen, and which had no substantial basis. The calculations in the report were made upon ascertained facts; and there was no known system of calculation or arithmetic which would give more reliable data. They recognized that the years to come would be years of very great difficulty in regard to the undertaking; but the consideration which had had great weight with the Sub-Committee—and he did not know one which had had greater weight with himself—was the attitude of the public towards the concern. He quoted from Mr. Hammond's report, wherein it was pointed out that every citizen who took the light not only helped on the works, but also tended towards a reduction in the price; but he said these very reasonable anticipations had not been justified by the results. When they were considering whether they should retain or part with the undertaking, this was a serious factor, because they depended largely for their prosperity on the attitude which the public generally took up with regard to their own concern. He should be expressing it very mildly when he said that, having decided to adopt this "child," the affection which had been lavished upon it by its "foster-parents" had far more frequently taken the form of admonition than encouragement. During the ten years they had had the undertaking, they had reduced the charge for current for lighting purposes from 6d. to 5d. per unit, with a further concession in the way of discount which in cases brought it down to 4d. They had reduced the charge for the supply of energy for power from 2½d. to 1¾d., with a sliding-scale bringing it down to 1d. These benefits were secured for the future. Finally, if they parted with the undertaking on the terms proposed, they would go out, after ten years, with a net profit to the Corporation of between £40,000 and £50,000.

METROPOLITAN WATER BOARD.

Cutting Off Supplies for Non-Payment of Rates.

At the Meeting of the Metropolitan Water Board last Friday, the Finance Committee presented a report in regard to the withdrawal of water supplies. They stated that they had received a number of letters from the Metropolitan Borough Councils and from local authorities outside London on the subject of the disconnection of supplies in consequence of non-payment of water-rates, and suggesting that the Board should discontinue what was described as "the practice of the Companies" in the matter, and adopt legal proceedings as a means of recovering the rates. The Committee stated that they were fully alive to the objections against the practice of cutting off supplies, and arrangements were being made whereby summary proceedings for the recovery of arrears would be taken in the majority of cases. They suggested that, if at any time the local authorities found that the disconnection of a supply was likely to occasion the slightest danger to the public health, they should direct their officials to communicate with those of the Board, who would promptly act in concert with them in order to obviate the possibility of the danger referred to. Dealing with the present procedure, the Committee stated that the facts were as follows: No supply is cut off for non-payment of rates (*a*) without an order of the Committee after a full inquiry into the whole of the circumstances; (*b*) where the premises are known to be occupied by more than one family; (*c*) where inability to pay by reason of real poverty is established; (*d*) where the owner and not the occupier is responsible by law or agreement for the payment of the water-rate. In conclusion, the Committee pointed out: (1) That notice to "cut off" is sent to both the Clerk and the Medical Officer of Health of the local authority concerned, instead of only to one of these officers, as formerly; (2) that during the half year ending Michaelmas, 1906, with 1,100,000 supplies, only 214 were withdrawn for non-payment of water-rate, and of these only about 150 were inhabited houses; (3) that, with a view to giving the local authority information as to the reason of disconnection, they had arranged that the notices sent to them should in future state this. They deemed it advisable to call the attention of the Board to the appreciable loss of income which might result if cutting off as a remedy for non-payment of rates were to be immediately and wholly abandoned. The report was received.

WOKING AND GUILDFORD WATER ARBITRATION.

The proceedings in this arbitration (*ante* p. 485) were resumed on Monday of last week.

Mr. Balfour Browne, K.C., and Mr. W. H. Dickinson, M.P. (instructed by Messrs. Chas. A. Bannister and Reynolds), appeared for the Company; and Mr. E. Honoratus Lloyd, K.C., Mr. Vesey Knox, K.C., and Mr. R. S. Clease (instructed by Mr. F. S. Miller, Town Clerk) represented the Corporation.

Mr. *A. L. Ryde*, of Messrs. Ryde and Sons, surveyors, gave evidence for the Company. Dealing with the probable increase in the water-rental in the whole area of the Company, he said his opinion was that in future years this would increase at the rate of 9 per cent. in 1906, 8½ per cent. in 1907, then the rate of increase would decrease by ½ per cent. down to 5 per cent., when he thought that it would continue to increase by about 5 per cent. This was a moderate estimate, and was more likely to be increased than not. Having ascertained the profits of the severed area, he thought it should be capitalized at about 30 years' purchase. He had never known water income to go back as a whole. It might be a very slow increase; but it had never decreased to his knowledge.

Mr. Honoratus Lloyd remarked that he could save trouble by saying that, so far as the maintainable profit was concerned, he would agree with about 30 years' purchase.

Mr. *William Cash*, of Messrs. Cash, Stone, and Co., said that the profits of the Company had increased very rapidly indeed. In 1898, they were £4061, and in 1905 £8707; so that they had nearly doubled in the course of seven years.

In reply to the Arbitrator, witness said the success of the Company could not be measured *pro rata* by the dividend paid, because this had to be paid on a greater expenditure of capital. The increase in the severed area was more rapid than that in the whole district. With regard to the severed portion, he said the rest of the undertaking would be working on a higher rate of expenses because of the severance.

In reply to Mr. Honoratus Lloyd, witness said that at no date hereafter would the Company have been in such a good position as if the transfer had not taken place.

Mr. Balfour Browne: So you think that the extra expense due to severance is to be treated as a permanent charge?

Witness: Yes.

This closed the case for the Company.

Mr. Honoratus Lloyd said that his learned friend took it that the Corporation were buying that portion of the undertaking which was in the added area without any exception whatever; and he had based his case upon this assumption. But they were buying, as the Act of 1899 said, "such portion of the water undertaking of the Company excepting the land, wells, streams, adits, waters, water-works, mains, hydrants, pipes, and other apparatus, if any, which shall be necessary or convenient for supplying water in the other parts of the limits of supply of the Company." So that they were buying such portion of the undertaking, with very important exceptions. All that he bought were the actual distributing mains which were necessary for the Company to carry on the supply of their district. After capitalizing the profits and anticipated profits, his learned friend gave him no credit whatever for the works which he did not get. Counsel next referred to another clause in the Local Act, as to the future interests of the Company in the severed area, and said it had been argued by prominent Counsel in Parliament last session that, after a district had been taken over, a company could lay down fresh mains. He agreed that the first item should be the capitalized value of the maintainable profit in the year 1905; he agreed that the second item should be the capitalized value of the anticipated yearly increase of profit; and he agreed that the third item should be the loss, if any, by severance. But he claimed that he was entitled to deduct the value of the lands, &c., as mentioned in the Act, necessary for the supply of the area of the Company. He disagreed most thoroughly with an argument that had been used, that there was any usual allowance of 10 per cent. for compulsory purchase in cases of this sort. When the Company acquired the right to supply Stoke-next-Guildford with water, they undertook, in agreement with the Guildford Rural District Council, to give a fixed discount on their statutory charges. The Company were claiming on their full statutory charges, which, according to the agreement, were impossible.

Mr. Balfour Browne remarked that he thought it would be found that the agreement was not worth the paper it was written on.

Mr. Honoratus Lloyd replied that it might be necessary to state a case on this point. Continuing, he proceeded to deal with the various heads of the Corporation's valuation, which he summed up as follows: Present income, less value of works necessary to earn it, £16,520; future income, less share of capital expenditure necessary to earn it, £2996; and severance, £4472—making a total of £23,998. With regard to the first item, he agreed that the basis of 30·77 years' purchase was the right one; but, when they came to deal with anticipated income, he thought a 25 years' purchase was quite sufficient. He did not deny for a moment that the result of severing part of this undertaking would be to leave the Company for a period with a higher ratio of working expenses; but he objected to the suggestion that they would for all time be saddled with an increased ratio of expense. Then, as to the claim of 10 per cent. for compulsory purchase, this was not like a claim for land, where there might be some sentimental reason. In cases of water and gas undertakings such as this, 10 per cent. was altogether out of the question. To cover any little leakage there might be, 2 per cent. at the outside would be quite sufficient.

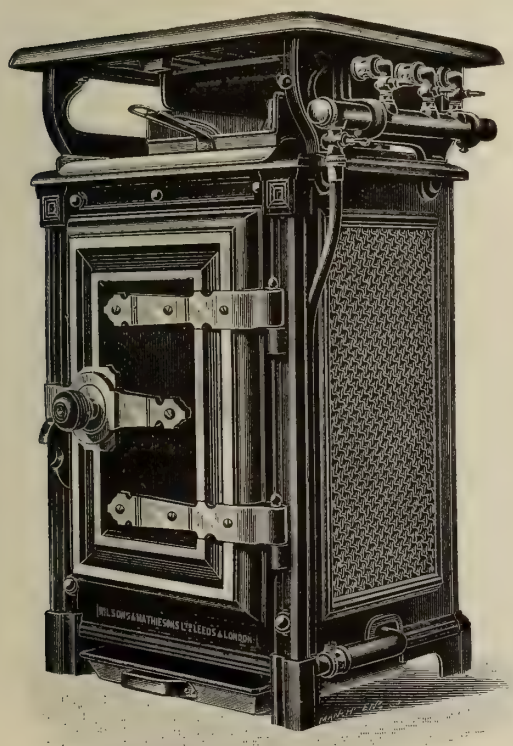
Mr. *E. L. Lunn*, Surveyor to the Hambledon Rural District Council, and also to Lord Onslow, gave evidence to the effect that there was plenty of land near Guildford under development which was far more suitable for building purposes than that in the severed area.

Other local evidence having been given by Mr. *F. F. Smallpeice*, ex-Mayor of Guildford, the proceedings were adjourned.

Mr. *Brough Taylor*, M.Inst.C.E., was examined at length on Tuesday

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by Mr. HONORATUS LLOYD. Witness said he had taken the expenses in the severed area as one-tenth instead of one-ninth of the whole, as agreed in the tables of working expenses. This gave him working expenses in the severed area amounting to £571, and left a net profit of £808, as against £906 claimed by the Company. This was one of the effects of the Stoke agreement. It reduced the profit to £808; and this, capitalized at 30 years' purchase, made a total of £22,240.

Mr. HONORATUS LLOYD: Here we acquire the undertaking less any water-works to earn that profit. You have deducted, therefore, from that total the works necessary to earn it. Will you tell us how you have done this?

Witness: The structural value of the whole of the Company's works I estimate from the figures given at £192,822. This figure I obtained from the agreed amounts, and then I take one-tenth of this as applicable to the severed area, which gives me the sum of £19,282. From this I deduct the value of the Company's existing mains which are to be transferred to the Corporation, £7413. I am assuming we take over the mains now used by the Company; and this leaves the value of the works, &c., which should have been transferred to the Corporation but which are retained by the Company at £11,869. I think the residuum of the works, however, would not be of much use to the Company for eleven years from the date of transfer; and I have deferred the present value (£11,869) for eleven years on the 4 per cent. table, which is £7710—leaving the net value of the transferred portion of the undertaking at £16,530, according to the 1905 table of profits made by the Company.

In reply to further questions, witness said he had assumed that during each future year additional water receipts would accrue to the Company from the severed area, from which a net profit of £60 would be derived. Thus an annuity of £60 was assumed to be created for each future year. This, capitalized at 25 years' purchase, and discounted on the 4 per cent. table, gave £13,666. To earn this, however, new works, &c., would have to be undertaken. This prospective increased capital expenditure he estimated at £6570, leaving the expectant increased profit £7096; making a total of £23,626. There were certain small items added which increased the total to £24,598. If he adopted Mr. Lunn's figure of prospective increase (£42 per annum) as an alternative, his total valuation was £23,998. In his opinion, there were no grounds for adding 10 per cent. for compulsory purchase.

Cross-examined: Amounts were allowed by arbitrators occasionally with regard to compulsory purchase; but they were generally given in the award, and were difficult to ascertain. He remembered that in the London Water Arbitration there was a distinct clause barring the arbitrators power to award any such percentage.

Mr. BALFOUR BROWNE: Does not that look as if it was a recognized practice?

Witness: I do not agree.

In further cross-examination, witness said there was no such clause in the present case. He had made his valuation on the assumption that the agreement with the Guildford Rural Sanitary Authority [the Stoke agreement] was valid. If it were not, he would have to go back to a higher figure of profit previously agreed to. The supply main through the district would be unproductive.

Mr. BALFOUR BROWNE: Deducting £3500 for this main from your valuation gives us £20,498. What would be the income from this at 3½ per cent.

Witness: It would be £650.

So that you are offering us £650 as against £808, which you yourself admit is our profit.

In re-examination, witness said that when the Corporation took over the severed area, they charged consumers similar rates to those paid by consumers in the borough and paid the Company their statutory charges—making up the difference from the borough funds. The outcome of this was a considerable increase in the number of consumers in all departments, with the result that 1906 was an extraordinary year in every respect, and should not be taken as a basis of any calculation for arriving at ordinary values. It was obvious that, to meet future requirements, taking Mr. Quick's own figures, he would have to increase his works and capacity at Chertsey.

Mr. *Samuel Wood*, of Messrs. Wood, Drew, and Co., who examined the Company's books, and who assisted to prepare the agreed tables, said that, when going through the books, he was told certain items had reference to an indulgent agreement for Stoke, which was 20 years old, but which was not being used; and he did not go into the question in any way.

Mr. *Geo. W. Strachan*, M.Inst.C.E., described the Company's existing works, and said it was necessary that provision should be made for the maximum demand during the minimum of supply, and they must, for this purpose, have a substantial margin. In the busy hours of the day during the time of maximum supply, they ought to have main capacity double their maximum supply. In 1917, he contemplated a maximum demand of 3,174,000 gallons per day; and to meet this 2,694,000 gallons would have to be brought from Chertsey daily. He described alternate schemes for providing this supply from Chertsey, which practically in each instance would mean a capital outlay of £25,000. He estimated the value on the present profit basis at £27,203; prospective value, £13,147; total, £40,350; add for severance, &c., £1386; grand total, £41,736. From this he deducted for works retained by the Company and not handed over to the Corporation £8125, and £7083 the proportion of future capital necessary in order to earn the increase, £15,208; leaving a net value of the undertaking in the severed area of £26,528. If the Stoke agreement were valid, then this amount would be reduced by a further £4900.

This concluded the evidence; and the hearing was adjourned for speeches of Counsel until Monday, March 11.

The North Ormesby Gas Company have recently placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a three-lift gasholder to replace an existing single-lift holder in the present tank.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Though the death of Mr. William Young, of Peebles, yesterday afternoon was not unexpected, the feeling of regret to which the removal from our midst of so distinguished a man gives rise is just as strong as if it had come suddenly upon us. I have known Mr. Young for twenty years —latterly much more intimately than at the first. Like everyone else, I was never in his company but I learned something from him. He was a man for whom the frivolities of life had no attraction. Yet he was one of the happiest of men whenever he found anyone willing to discuss with him some of the problems he had always seething in his mind. It was interesting to hear him relate how he advanced from point to point in the consideration of a particular subject. He was ignorant of finality. When he had reached a certain stage, that was to him firm and sure ground; next time you saw him he was farther on, and saw the thing from a different standpoint, yet maintaining the continuity of his inquiry. The subjects that were next his heart were also on the tip of his tongue. He could speak without cessation upon them; but let him be asked to (say) propose a vote of thanks, and he could not command the language to do it. Probably this quality of his character was accentuated by the state of his health, which shut him out from all sociality, and drove him to his study and his laboratory. For a man who was nearly all his life far from being robust, the amount of work which he accomplished was amazing. This country—Scotland in particular—is much the richer in that she produced such a son as William Young. The mind is led to reflect upon what has been Mr. Young's reward for all his toil on behalf of his countrymen. A competency he secured, which is matter for gratification. But honours did not come his way. When we consider that some have risen into celebrity, even earned titles and been admitted into the highest society, whose qualifications have been no more than a versatile imagination, or a capacity for selling groceries, and that here is one who, grappling with the secrets of Nature, has brought millions of pounds sterling into the pockets of the people, yet has been allowed to die without a single title or letter of distinction to his name, and in such obscurity that the leading newspaper in Scotland to-day bestows no more than twenty-five lines of print to his memory, we are forced to the conclusion that the system of awarding honours in this world stands very much in need of amending. He received honour, universally, among his scientific brethren; but the world at large, which benefited by his labours, knew him not. Surely, now that he has passed away, his name will not be allowed to be forgotten; but it is to be hoped some means will be taken for the establishment of a memorial to one who has been a greater benefactor, I venture to say, than if, following the example of some, he had given of his means lavishly for charitable purposes.

Mr. J. M'Leod, the Chief Chemist in the Provan Gas-Works, Glasgow, has been appointed Manager of the Kirkintilloch Corporation Gas-Works. The appointment was made at a special meeting of the Town Council on Wednesday. Of the nine names on the short leet, given in last week's "Notes," only three were submitted to the Council —those of Mr. M'Leod, Mr. W. Kelloch, of Kilsyth, and Mr. J. Wynne, of Carnoustie. Mr. Wynne dropped out at the first vote, and in the second vote, between Mr. M'Leod and Mr. Kelloch, the former obtained the post by seven votes to five. Mr. M'Leod, as we know, is at present President of the Western District of the Scottish Junior Gas Association. It is interesting to note that, though the Junior Association in Scotland is not yet three years old, Presidents of both districts have already received managerships. A year ago, Mr. J. Dickson, the President of the Eastern District, was appointed Manager of the new gas-works at Kelty; and now we have Mr. M'Leod, of the Western District, going to Kirkintilloch. These happy events would seem to support the conclusion that the Junior Associations are useful to the members, in the matter of providing channels for advancement, as well as in the building up of members in a knowledge of their duties.

At the monthly meeting of the Edinburgh and Leith Gas Commission on Monday, it was reported that a memorandum had been submitted by the Treasurer—Mr. John S. Gibb—to the Finance and Law Committee, showing that the amount borrowed on mortgage up to the 28th of January, 1907, was £911,352 (whereof £100,330 would be repayable at Whitsunday next), and that at the same date there had been borrowed as special fixed loans £219,957, and as temporary loans £37,038; making the total liability unsecured by mortgages £256,995. Towards extinction of the £100,330 of mortgage debt repayable, the Committee recommended that they should apply the £29,100 of sinking fund moneys lent on heritable security, and repayable at Whitsunday, thereby effecting a very considerable saving of interest to the Commissioners; and that the mortgage sinking funds should be called up when due, and applied towards reduction of the mortgage debt. The Committee also recommended that the balance of the mortgage debt should be renewed or replaced, and that the rest of the capital liability should be secured by issuing mortgages for three, five, or seven years, at 3½ per cent., and that the Treasurer should continue to supplement the mortgage debt by short loans, for a year or less, on as favourable terms as possible. These recommendations were agreed to.

A fire occurred in the Secretary's Office in the General Post Office in Edinburgh this week, which is believed to have originated through the fusing of an electric wire in contact with a gas-pipe, above the ceiling of the office, where work in connection with the electric lighting of the office is in progress. The fire was extinguished before very much damage was done.

Mr. W. B. M'Lusky, the Engineer and Manager of the Perth Corporation Gas-Works, has been ordered by the Town Council to prepare a detailed estimate of the additional purifying plant required.

The annual reunion of the employees of the Peterhead Gas Corporation was held in the coal-store in the gas-works on the evening of Wednesday of this week. The place had been nicely prepared for the occasion, and beautifully decorated. After tea, Bailie Birnie, the

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"BLAND."

Convener of the Gas Committee, said the late Convener—Mr. Ritchie—had left the gas-works not only in a very efficient state, but had also left a staff of employees whose equal they would search the breadth of Scotland to find. At no time in the history of the gas-works were affairs in a better position than at present. They were now augmenting their storage, which would add greatly to the efficiency of the gas supply. During the year they had added 192 prepayment meter consumers, making a total of 1055 of that class. Prepayment meter consumers had used 9½ million cubic feet of gas—equal to a value of £1538—in twelve months. They had also added 261 new consumers of the ordinary class. Mr. W. Ritchie, the Gas Manager, proposed a vote of thanks to the Magistrates and Town Council.

The interdict which I mentioned last week as having been applied for by the Earl of Southesk and others against the Corporation of Arbroath, with reference to the abstracting of water by the Corporation from the Noran stream until the Corporation are in a position to provide compensation water, has been, to all appearance, settled by the Corporation allowing interim interdict to be issued. They did not lodge answers, but, as the result of negotiations, a restriction was agreed to, which will allow water to be taken for any purpose except that of supplying Arbroath; and the Corporation did not oppose the granting of the interim interdict.

CURRENT SALES OF GAS PRODUCTS.

Week ending March 2.

The London market for tar products remains in a steady position. There is very little news to report, except that pitch attracts increasing attention for this year's delivery. Benzol 90 per cent. is in demand; sellers asking 11d. to 11½d. net. Sulphate of ammonia is still without change.

LIVERPOOL, *March* 2.

Sulphate of Ammonia.

The market has assumed a quieter tone, and it has not been so easy to dispose of the available supply. While production remains near its maximum, there has not been any special demand from any point, so that towards the close producers have been obliged to make concessions in prices. The closing quotations are consequently £11 16s. 3d. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 1s. 3d. to £12 2s. 6d. per ton f.o.b. Leith. Neither has there been much disposition to buy for delivery ahead, though some makers have indicated prices not much above spot values. There has been a fair amount of inquiry, but buyers seem inclined to wait events.

Nitrate of Soda.

This article is very firm in all positions, and spot prices remain 11s. 6d. per cwt. for 95 per cent., and 12s. per cwt. for refined quality.

LONDON, *March* 2.

Tar Products.

There has been little alteration in the markets during the past week. Pitch is steady, but there is not much business doing. In London, manufacturers appear to be easier than was the case a short while ago, and seem quite willing to await the course of events before placing any further quantity, though doubtless they will sell small lots from time to time at current market prices. On the east coast, business has been done at 25s. Hull and Goole; while upon the west coast, 24s. has been accepted for delivery from now to June. In South Wales, consumers appear well covered for prompt delivery; while on the Continent, business is only possible for next season, and at prices which at present have no interest for dealers. Creosote is firm. Makers all round are well sold, and do not care to entertain any business except at very high prices. In London, second-hand parcels are sold from time to time at reasonable prices; but makers themselves ask 2¼d. to 2⅜d. In the Midlands, it is reported that 2⅜d. has been paid; while in the North, manufacturers prefer to see the course of events before placing any further quantity. Benzol, 90 per cent., is decidedly quiet. Some quantity of it was sold on the east coast at 10d.; while business has also been done at equal to 8d. per gallon at makers' works in the Midlands. There is a good deal of this quality offering, while the demand appears to be limited for the present. Fifty-ninety per cent. is in good demand; but there is not much obtainable, and small parcels continue to be sold at good figures. In toluol, makers are well sold and very firm in their ideas, and at present refuse to consider anything under 1s. 1d., naked, at their works. Solvent naphtha appears easier. There are sellers of best quality 95 per cent. on rails London at 1s. 4½d., while ordinary qualities could be secured at 1s. 3½d.; but buyers refuse to offer more than 1s. 3d. On the east coast, business is reported at 1s. 1½d. Carbolic acid is quiet, and the position unchanged; manufacturers refusing to consider the prices put forward by consumers. In crystals and anthracene, there is no alteration in either article.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 25s. 9d. to 26s. 3d.; east coast, 25s.; west coast, 24s. Benzol, 90 per cent., 10d. to 11d.; 50-90 per cent., 11¼d. to 11½d. Toluol, 1s. 2d. to 1s. 2¼d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅛d. to 2⅜d.; North, 2d. to 2⅛d. Heavy oils, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 8¾d. Naphthalene, £6 to £9 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

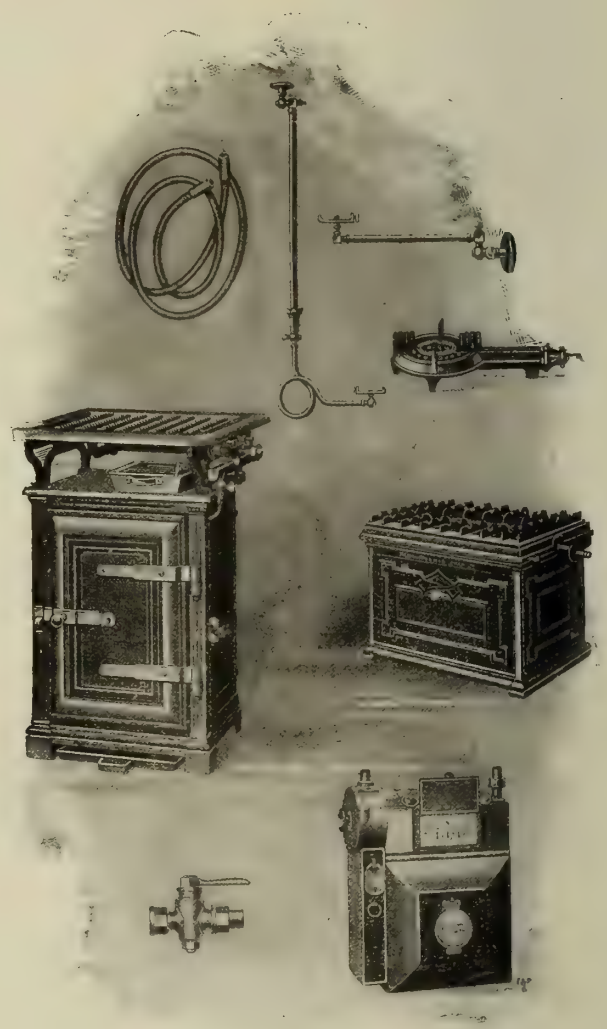
The market has been quiet during the past week, and prices have had a downward tendency. The principal London Companies are well sold, and not prepared to consider business except at a good figure. On the other hand, outside makes have been offered at very low prices indeed, and business has been done at £11 17s. 6d. upon London terms; while stuff upon Beckton terms could, no doubt, be obtained at under this figure. In Hull, business in ordinary makes has been done at £11 17s. 6d.; but for the best qualities, £12 has been offered. In Leith, manufacturers are well sold and firm in their ideas; and the value may be taken as about £12. In Liverpool, business is reported to have been done at prices varying from £11 18s. 9d. to £12.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The coal trade of the country is in a very satisfactory condition. All sections of trade, from the staple industry—cotton—extending to the engineering and general manufacturing works, are well employed, and added to these we have a flourishing shipping trade and a great household inquiry. Prices are being well kept up, and in some directions are on a rising scale. In gas coal and cannel, however, there is not much doing. One of the cannel mines of the Staveley Iron and Coal Company is being closed, we understand, on the ground that its working does not pay expenses. In other quarters, there appears to be some indifference in cannel getting—that is, where the mineral is not of the very highest gas-producing quality. Average quotations for coal (at the pit's mouth) on the Manchester Coal Exchange are as follows: Best house coal 14s. 6d. to 15s. 6d., secondary 13s. 6d. to 14s. 6d., common 10s. 6d. to 12s. 6d., burgy 8s. 10d. to 9s. 6d.; best slack 8s. to 9s.; medium and common 7s. to 8s., coal for bunkering and export, f.o.b. Garston, 12s. to 13s., and furnace coke 17s. to 24s.

Northern Coal Trade.

There is a slight ease in the Northern coal trade—in part due to the delay in the arrival of steamers, and to the lessened demand for some classes of fuel through the milder weather. In the steam coal trade, best Northumbrians are about 14s. 9d. per ton f.o.b., second-class steams are steady at 13s., and steam smalls are relatively firm and quoted at about 8s. 6d. The collieries are working well, except where delayed steamers have interfered with the shipment. In the gas coal trade, there is, as usual when March has been entered upon, a decrease in the deliveries on the large contracts. But the output of the chief collieries is generally well taken up; and there is now some increase of the exports of gas coal under sales that have recently been made. Prices of Durham gas coal vary from about 12s. to 13s.; but for one or two kinds, 3d. per ton above the last-named figure is asked. One or two additional contracts have been fixed—one for Sweden, at a quotation that is expected, with the usual freight allowance, to leave about 13s. per ton as the f.o.b. price. For one of the Tyneside towns, some 40,000 tons have been booked; and it is believed that the average price would be equivalent to 12s. 6d. per ton f.o.b. Coke is steady; and gas coke varies from 13s. 6d. to 14s. 6d. per ton f.o.b.—the demand being steady, and the output rather less.

Scotch Coal Trade.

Trade is still going on the same lines. Coal is scarce, and is getting dearer—public intimation having been given that retail prices are to be up about 1s. The demand shows no sign of abatement. The Coal Conciliation Board in Glasgow last week agreed to advance the wages of the miners by 6¼ per cent.—equal to 3d. per day—being the second increase of a similar amount within a month. The prices quoted are: Ell 12s. 3d. to 13s. 6d. per ton f.o.b. Glasgow, splint 13s. to 13s. 6d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 218,310 tons—a decrease of 36,825 tons upon the preceding week, and of 20,276 tons upon the same week of last year. For the year to date, the total shipments have been 1,793,091 tons—an increase of 34,560 tons upon the corresponding period of 1906.

Gas Smells at Hollinwood.

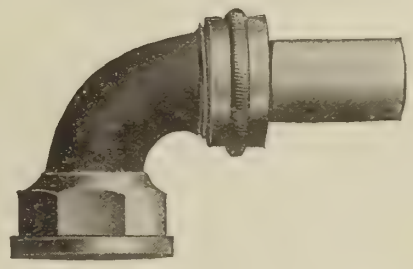
In the course of his address to the members at the annual dinner of the Hollinwood Improvement Association, the President (Mr. James Whiplech) alluded to the making of water gas at Hollinwood. He said the Association had been the means of organizing a petition to be sent to the Oldham Gas Committee; but this course was only resorted to after innumerable efforts had been made, and a multitude of correspondence had passed between the Association and Alderman Hanson, the Chairman of the Gas Committee. Nothing was done; and ultimately they decided to have a petition, which, in a short time, was signed by over 320 of the ratepayers. When the petition was presented, the three representatives of the ward were present; and they were received most courteously by Alderman Hanson. He (the speaker) pointed out that the matter had become very serious, and that all the medical men in the district had not only signed the petition, but were willing to come forward and testify if necessary that there was a nuisance. He thought at the time that they made a very strong impression on the Gas Committee; so much so that the Town Clerk, who happened to be there, said: "You know we shall be able to get scientific evidence to prove that it is not a nuisance." This showed them at once that the Town Clerk expected there would be a law suit. Unfortunately, the Association were not able to go so far, though it was his (the President's) opinion that, had they been in a suitable financial position, they could have got an injunction against the Corporation, because the ratepayers and the three councillors for the ward said it was a nuisance. If this was not sufficient evidence of nuisance, he did not know what was. In addition to this, the quality of the gas was not as good as it ought to be.

Gas-Works Extensions at Teignmouth.—Colonel A. J. Hepper, a Local Government Board Inspector, held an inquiry at Teignmouth last Wednesday, respecting the application of the Urban District Council for permission to borrow (among other sums) £700 for the purposes of their gas undertaking. In the matter of telescoping the gasholder and providing six new retorts, Mr. J. A. Gray, the Gas Manager, gave evidence to the absolute necessity for increasing the storage and carbonizing plant, to meet the demand for gas occasioned by the installation of slot meters. No opposition was raised to the scheme, other than by Mr. Churchward, who objected to the increasing rates; but his remarks were rebutted by the evidence of the Clerk and Mr. R. Harris (Chairman of the Gas Committee), who claimed that the rating of the town was nothing more than could be expected, in view of the great improvements carried out.

SAWER & PURVES

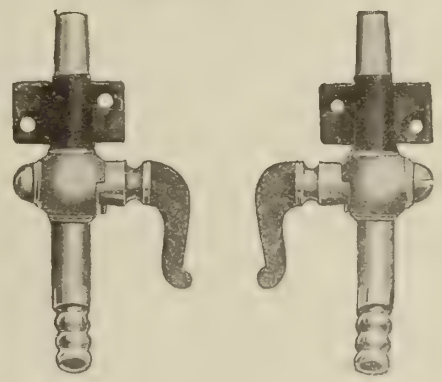
Stove Fittings.

STOVE BEND.



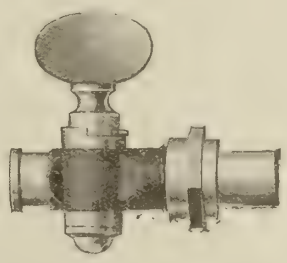
No. 112.

WING HOB TAPS.



No. 114.

STOVE TAP.



No. 110.

SAWER & PURVES,

MANCHESTER & NOTTINGHAM.

Worthing Gas Bill.

An extraordinary meeting of the shareholders in the Worthing Gas Company was held last Saturday week, to approve the Company's Bill for further powers, including the construction of works at Goring, with a view to the ultimate removal there of all the manufacturing operations. Agreement was reported between the Company and the Corporation. In effect, all the wishes of the Corporation, as expressed at the special meeting of the Town Council (a report of which appeared in the "JOURNAL" for Feb. 19, p. 486), have been met. Opposition came from Mr. P. E. Schweder, who criticized at length the proposed consolidation of stock, and also the abandonment of the Ham Arch site, which he insisted was a suitable one. There was solid opposition to the Bill, he declared, from the inhabitants of West Worthing and Goring; and he said the petition against it was signed by the District Council, the Goring and Durrington Parish Councils, and most of the people living in the district to which it was proposed to take the works. In reply to a complaint by Mr. Schweder, that he could get no answer to his questions for information, the Chairman (Mr. H. H. Gardiner), replied that Mr. Schweder was opposing the Bill. The shareholders' meeting was not the place for an opponent to come to for information with which to fight the Company. Only two or three hands were held up against the resolution to approve the Bill; but Mr. Schweder demanded a poll. This was taken at once, with the result that the capital voting for the Bill was announced to amount to £36,785, and the capital against it to £10,080. The votes recorded were 1204 for the Bill, and 450 against.

Reduction in Price at Cheltenham.—The Directors of the Cheltenham Gas Company announce that, in view of the passing of the Cheltenham Gas Act, 1906, they have decided to reduce the price of gas from 2s. 4d. to 2s. 2d. per 1000 cubic feet, from the date of the reading of the meters in December last, so that the price, less the discount of 5 per cent., now amounts to a trifle over 2s. per 1000 cubic feet.

Death by Gas Poisoning in a Dumfries Hotel.—A man named Hood, a horse-dealer, residing in Londonderry, met his death by gas poisoning in a Dumfries hotel in the night between Thursday and Friday of last week. He arrived in Dumfries on business on Thursday night, and went to his room. Next morning he gave no response when called; and on the room being entered, he was found lying dead in bed. The room was filled with gas; the tap being turned full on. It is believed that the occurrence was accidental.

Stockport Water-Works Litigation.—At a meeting in committee last week, the Stockport Town Council further considered the question of appealing against the judgment of the Official Referee in the action of Mr. Abram Kellett against the Corporation, in which, it will be remembered, the Referee awarded Mr. Kellett, the contractor, £52,546 of which £29,400 was compensation in respect of loss of profit. It was in regard to the latter sum that the question of appeal turned. The Committee recommended that the appeal should not be proceeded with; and the Council finally decided by 28 votes to 6 to accept the recommendation.

Suicide by Gas Poisoning.—Last Thursday an inquest was held on the body of a naval lieutenant named Edmund David Faber, son of the Danish Consul-General in London, who was found dead on Tuesday in his cousin's chambers in the Inner Temple. Evidence was given that the deceased had never threatened to take his life. He did, however, suffer from fits of depression. A laundress deposed to finding the deceased lying across a gas-stove, with his head on the asbestos. There was a strong smell of gas. Another witness stated that the gas-tap connected to the stove was full on; and a cushion had been placed up the chimney. Medical evidence showed that death was due to coal-gas poisoning; and the Jury returned a verdict that deceased committed suicide while insane.

Value of the Malton Gas Company's Shares.—At Malton, last Tuesday, Messrs. Boulton and Cooper offered for sale 22 fully-paid £10 shares in the Malton Gas Company. The biddings commenced at £22 10s. per share and went up to £25, at which figure they were withdrawn. Considerable interest was aroused in the sale, because the electric light has been introduced into Malton, and people were curious to see what effect this would have on the value of the Gas Company's shares. The decision of the vendors' Solicitor not to take £25 apiece for those offered evoked from a would-be purchaser the question: "Why, what price do they want for them?" It may be of interest to give the results of sales of these shares over a period of thirty years. On Feb. 1, 1877, the £10 shares fetched, at a public sale in the town, £20 2s. 6d. each; ten years later they had run up to £25 10s. In September, 1891, they realized £26 per share; in January, 1894, £26 12s.; and at the last public sale on Feb. 26, 1901, they sold at £25 12s. 6d. each. None of these figures were "records." In March, 1891, £27 2s. 6d. per £10 share was paid; but this was for a small purchase, and under exceptional conditions.

Opposition to the Southport and Birkdale Water Bill.—A special meeting of the Ormskirk Urban District Council has just been held to consider the question of opposing the Bill which the Southport, Birkdale, and West Lancashire Water-Works Board are promoting. In answer to a member, the Law Clerk stated that it would cost the Skelmersdale Urban District Council £600 to get their protective clause put in the Bill. Mr. C. F. Ellis, the Chairman of the Water Committee, explained that the Bill provided for the acquisition by the Board of Scarth Hill works from the Skelmersdale Council. The Ormskirk Council were advised that by the Bill the Water Board would be able, if they thought fit, to deepen the well and borehole at Scarth Hill, and to obtain an increased supply of water by tunnelling or by pumping from a greater depth than was now the case. It would be inevitable that an increase in the supply of water pumped at Scarth Hill would have the effect of inducing a flow of water from the neighbourhood of the Ormskirk Council's wells towards Scarth Hill, and diminishing or abstracting the supply now available for Ormskirk. The Council would be satisfied if they could get a protective clause inserted in the Bill in the same way that Skelmersdale had done. It was decided to oppose the Bill, which is also being opposed by the Lathom and Burscough Urban District Council.

SEASON 1907.

The "MAIN"

Gas

Cookers



FOR SLOT INSTALLATIONS.

R. & A. MAIN, LIMITED,

LONDON, GLASGOW, AND FALKIRK.

ALSO AT

BIRMINGHAM, BRISTOL, MANCHESTER, MELBOURNE, AND SYDNEY.

The Non-Explosive Gas Syndicate, Limited, has been formed, with a capital of £5000, in £1 shares, to exploit non-explosive gas.

When Alfred C. Richards, a collector, should have appeared (on remand) at the Swansea Police Court last Tuesday, to answer a charge of embezzling £1 4s. 4d. belonging to the Swansea Gas Company, it was stated that he had absconded; and a warrant was issued for his arrest. At the same sitting, Frank Southwood was charged with embezzling 18s. 9d. belonging to the Company, and was remanded on bail.

The Port Erin and Port St. Mary Gas Company (Isle of Man) have given Messrs. J. Firth Blakeley and Co., of Dewsbury, an order for a new tank 50 feet in diameter and double-lift gasholder, together with one of their improved combined gas-engines and exhausters and regenerative retort-settings. Messrs. Blakeley and Co. have added to their works a new gasholder shed, which has been fitted up with machinery, including radials, straightening and bending rolls, punch and shears, and gasholder multiple punching machine.

The City of Birmingham Gas Department works staff held their third annual dinner and concert on Saturday evening at the Court Restaurant, Corporation Street; and a very pleasant evening was spent. The gathering was a large one, and furnished convincing evidence of the popularity of the function. Mr. W. Chaney occupied the chair; and interspersed with the musical part of the evening's entertainment was a short toast list. Mr. F. J. Bywater proposed "The Department and Our Chief," coupling with it the name of Mr. Henry Hack, who was, he regretted to say, unable to be with them at the dinner, and to whose continuous work for the benefit of the gas undertaking he referred. Mr. Chaney replied on behalf of Mr. Hack and the department. Subsequently, Mr. E. H. Harman proposed "Success to Our Annual Dinner," coupling with it the old members of the staff who were with them that night and the visitors. The last toast—"Our Chairman"—was proposed by Mr. Goad, and acknowledged by Mr. Chaney. The concert was an excellent one, and was thoroughly enjoyed.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
GENERAL MANAGER (NEW LIGHTING AND HEATING GAS). Garlick and Co.
CARBONIZING FOREMEN. No. 4725.
CLERK. No. 4726.
RENTAL CLERK AND COLLECTOR. Hemel Hempsted Water Department. Applications by March 8.
GAS-FITTER. (Saltburn) Apply Redcar Gas-Works.

Situations Wanted.
ASSISTANT-MANAGER OR DRAUGHTSMAN. No. 4731.
ENGINEER OR ASSISTANT. No. 4732.
MAIN AND SERVICE LAYER, &c. No. 4733.
SHOW-ROOM MANAGER OR INSPECTOR. No. 4729.

Plant, &c., For Sale.
PURIFIERS, &c. W. W. Box, 28, Great James St., W.C.
PIPING (6-INCH). Broom and Wade, High Wycombe.
PIPES AND TANKS. No. 4721.

Plant, &c. (Second Hand) Wanted.
GASHOLDER AND PURIFIERS. Ramsey Gas Company.

Patent Rights for Disposal. Gas Manufacture. Newton and Son, Bream's Buildings, E.C.

Stocks and Shares.
ALDERSHOT GAS AND WATER COMPANY. March 19.
BRIGHTON AND HOVE GAS COMPANY. March 19.
CHERTSEY GAS COMPANY. March 12.
DORKING GAS COMPANY. March 12.
HAILSHAM WATER COMPANY. March 13.
HAMPTON COURT GAS COMPANY. March 12.
LEA BRIDGE GAS COMPANY. March 12.
LEATHERHEAD WATER COMPANY. March 25.
NEWPORT (MON.) GAS COMPANY. March 22.
NORWICH WATER COMPANY. March 22.
PINNER GAS COMPANY. March 21.
SOUTHGATE AND DISTRICT GAS COMPANY. March 19.
SOUTHEND GAS COMPANY. March 12.
UXBRIDGE GAS COMPANY. March 12.

TENDERS FOR

Boiler.
OMAGH URBAN DISTRICT COUNCIL. Tenders by March 14.

Coal.
SLIGO GAS COMPANY.

Coke.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 18.

Exhauster.
STOURBRIDGE GAS DEPARTMENT. Tenders by March 13.

Fire-Clay Goods.
NEWTON-IN-MAKERFIELD GAS DEPARTMENT. Tenders by March 16.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 14.

Gasholder and Tank.
WOLSTANTON GAS DEPARTMENT. Tenders by March 23.

General Stores, Various Fittings, Lead and Compo. Pipe, Ironmongery, Lime, Oils and Paints, &c.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 14.

Mantles.
MIDDLETON CORPORATION. Tenders by March 18.

Meters.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 14.

Oxide of Iron.
BLACKBURN GAS DEPARTMENT. Tenders by March 9.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 25.

Pipes and Fittings.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 14.

Purifiers, &c.
KEIGHLEY GAS DEPARTMENT. Tenders by March 12.

Retort Settings and Alterations.
NEWTON-IN-MAKERFIELD GAS DEPARTMENT. Tenders by March 16.

Sulphate Plant.
OMAGH URBAN DISTRICT COUNCIL. Tenders by March 14.

Sulphuric Acid.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tender by March 25.
RAMSGATE GAS DEPARTMENT. Tenders by March 9.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 14.

Tar and Liquor.
EXETER GAS COMPANY. Tenders by March 9.
RAMSGATE GAS DEPARTMENT. Tenders by March 9.
STOKE GAS DEPARTMENT. Tenders by March 6.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 597.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14⅜—15⅝	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅝	..	5 1 10
50,000	10	Feb. 28	14	Bourne- mouth Gas and Water — 10 p.c. / B 7 p.c. / Pref. 6 p.c.	27—28*	..	5 0 0
51,810	10	,,	7		16⅛—17½*	..	4 2 4
53,200	10	,,	6		14⅝—15½*	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250—255*	−2	4 18 1
300,000	,,	,,	9⅜	Do. New	190—195*	−¾	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122*	−½	4 2 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	225—230	..	4 17 10
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	118—122*	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	89—93*	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11⅛—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8⅛—9½	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109—111*	+1½	4 10 1
1,443,280	Stk.	,,	5 5/16	Commercial 4 p.c Stk.	107—110*	−1½	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	105—108*	−½	4 12 7
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	123—126	..	5 3 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
460,170	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103—105	..	3 16 2
486,090	10	Jan. 31	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4 1/16	Gas- light and Coke — 4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb.	95½—96½	..	4 11 4
2,600,000	,,	,,	3½		87—89	..	3 18 8
3,799,735	,,	,,	4		106—108	..	3 14 1
4,193,975	,,	Dec. 13	3		84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	179—182	..	4 7 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
183,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 28	10	Liverpool United A	223—225*	+2	4 8 11
718,100	,,	,,	7	Do. B	164—165*	..	4 4 10
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3⅜	Monte Video, Ltd.	11⅜—12½	..	5 12 0
1,775,892	Stk.	Feb. 28	4⅝	Newc'tle & G'tesh'd Con.	107—109*	..	4 4 10
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½*	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14*	..	5 0 0
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7¼—8¼	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	+1	4 2 6
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	124—126	..	4 7 4
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	120—123*	−¼	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123*	−½	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Feb. 28	6½	Tottenham — A 5 p.c. / B 3½ p.c.	123—126*	−¾	5 3 2
398,940	,,	,,	5		101—103*	−½	4 17 1
137,500	,,	Dec. 28	4	Edmonton — 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10⅛—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	104—106*	+½	4 14 4
30,000	Stk.	Feb. 14	8	Wands- worth — A 5 p.c. / B 3½ p.c. / C 3½ p.c.	—	..	—
255,636	,,	,,	6⅝		138—143	..	4 10 11
75,000	,,	,,	5⅝		111—113	..	4 19 1
79,416	,,	Dec. 28	3½	Putney — 3 p.c. Deb. Stk.	79—82	..	3 13 2
845,872	,,	Feb. 28	5⅜	West Ham 5 p.c. Ord.	101—104*	−½	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123*	+½	4 1 4
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

The Davis Gas-Stove Company, Limited, have appointed Mr. W. R. Francis to the position of Commercial Manager for the North of England and Scotland.

The Coroner's Jury returned a verdict of death from misadventure in the case of Mrs. Pawley (aged 87), who was found dead in her bedroom at Brighton, with the tap of the gas bracket turned full on. It was stated that deceased had a horror of gas and never used it; and the Coroner suggested that perhaps the old lady on awaking was under the impression that someone was meddling with the gas, and inadvertently turned it on.

Mr. Alfred Richards will be offering next Tuesday, a new issue of consolidated stock of the Uxbridge Gas Company. It ranks for a standard dividend of 5 per cent., subject to the sliding-scale, and entitled, in view of the dividend last paid, to 4½ per cent. per annum. He will also invite, by order of executors and other owners, biddings for some ordinary stock of the Hampton Court, Lea Bridge, and Southend Gas Companies, and some fully-paid shares of various classes in the Chertsey Gas Consumers' Company, Limited. Particulars appear in the advertisement columns.

The "Chemical Trade Journal" says: One of the principal causes of the want of elasticity in the market for sulphate of ammonia, and its cheapness compared with nitrate of soda, is the enormous increase in the German output. The Nordstern Collieries Company last year produced from their coke-ovens 4846 tons, against 3602 tons in 1905; also 12,276 tons of tar and 1790 tons of raw and 1528 tons of refined benzol, against 9147, 1469, and 1273 tons respectively.

The Newcastle and Gateshead Gas Company recently arranged a gas-baked bread and cake competition, with the object of demonstrating the utility of gas; and the result was a great success—the winners being awarded prizes varying in value from £2 2s. to 5s. Of the large number of samples submitted, there were only six or seven loaves that were not almost perfect; and the task of judging was thus rendered difficult. Competitions were also held for photographs taken by gaslight, and for samples of linen ironed with gas-irons; but the entries in these two departments were not so satisfactory. The laundry competition, however, proved to what extent the utility of gas had been developed, as most of the articles had been cleansed in set-pots heated by gas, while all of them had been ironed with gas-heated irons.

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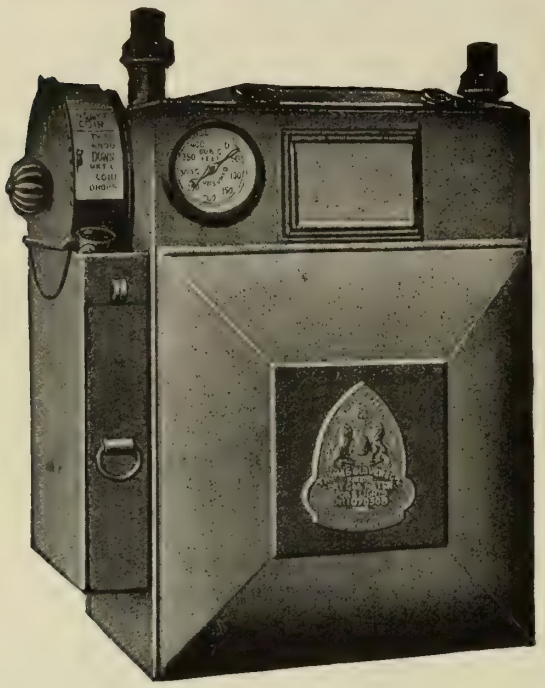
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VOL. XCVII., No. 2287.—TUESDAY, MARCH 12, 1907.

EDITORIAL NOTES—GAS, &c.

June in Dublin.

ALTHOUGH only in the second week of March, the Council of the Institution of Gas Engineers are already turning our thoughts to Dublin, and raising anticipations of a delightful visit and of a profitable meeting. Of this we may be sure, that the traditional warm-heartedness of the capital city of Ireland to organizations having for their end and aim the progress of the useful arts, will in every way be observed on the present occasion. There is only one regret, and it is that the Engineering Conference organized by the Institution of Civil Engineers has been arranged for the same week in London. But the attraction it holds out for gas men will, we think and hope, be insufficient to in any way affect the attendance at the Dublin meeting. The work of an engineer engaged in gas supply, it is true, laps over from the particular to the general—or, to put it another way, from his main line there are many spur lines to other fields of engineering activity. But, after all, the greater and imposing part of his work is centralized; and when choice is offered, he must needs go to the quarter that holds out for him the largest amount of promise associated with his special interests. So far as we have yet learned, the programme that is being arranged for the Engineering Conference in London will not contain a great deal that is of immediate concern to the gas engineer and manager. Up to the present, we are informed, only one gas subject has been entered, and that is on gas heating. Our information does not extend to the particular aspect to be taken in treating the subject; and the term presents such an amplitude of cover that, till more definite information is to hand, we cannot say whether its treatment will have importance from the commercial, the hygienic, or the engineering aspect. If either or both of the former, then we believe in every opportunity being taken to advertise gas, and we should be the last to suggest that the opportunity be missed. But from whatever standpoint the question is to be discussed, and important as every standpoint is, the question and importance are not sufficient in themselves to divert presence and interest from the many-featured meeting in Dublin. In saying this, we would not have it thought that we regard the two fixtures as antagonistic. They are only so in the matter of time. It is unfortunate; but the arrangements are such that there cannot possibly be any deviation from the arranged dates for the Dublin meeting. In Dublin, then, for a few days beginning with Tuesday, June 18, the greatest interest will lie for the engineers and managers of the gas industry.

The President of the Institution (Mr. Charles Hunt, M.Inst.C.E.) and the Council have meditated long and worked well to produce a programme worthy and characteristically suitable for the forthcoming meeting. The Gas Section of the Dublin Exhibition will in itself largely direct consideration to the commercial work of the industry; and the conjunction of the exhibition and the meeting naturally suggested that the proceedings at the latter should have a distinctiveness in regard to the utilization of gas, while at the same time not by any means neglecting production. The programme, so far as it relates to much of the technical part of the meeting, is yet, of course, only in a provisional stage, until the Council have considered any further offers of papers that may be made before the end of the present month. Therefore, the names of authors and the titles of papers are withheld for the time being. But we can indicate something as to the subjects which will, it is expected, be dealt with.

In the first place, nothing need be advanced here to raise expectations as to the address with which the President will inaugurate the meeting. We have had abundant experience of the quality of presidential utterances by Mr. Hunt. In him are embodied the gas engineer, gas maker, and gas administrator of long, extensive, and comprehensive practice; and we shall again sip of the cream of his mature practical and scientific knowledge. Then the Council have booked Professor Vivian B. Lewes to lecture on "The Use of Gas "from a Hygienic Standpoint." The ever-popular lecturer will command a hearty welcome; and it may be confidently said that the lecture will send a few deadly shafts into the misconception and error that exist, and help to bring about the dissolution of the immoral inexactitudes that the competitors of gas are so assiduous in propagating. It is understood that altogether seven or eight papers have been before the Council; and, through certain of them, conjunction will again be effected with the exhibition, in the treatment of questions affecting gas heating and incandescent lighting, and also on the general subject of the sale of gas. It will from this be seen that the trading side of the gas industry—the side upon which business is done in the staple product—will be presented in such manner as to give plenty of opportunity for consideration and for a valuable harvesting of experiences. Turning to engineering questions, it is highly probable—perhaps we might speak with even a little more certainty—that the members will have the gratification of welcoming from America a paper on the high-pressure system of gas distribution as there practised. It is on the carpet, too, that vertical retorts—being the particularly live subject of the day in gas-engineering polemics—will for the second year running have their problems and trial discoveries submitted for examination and dissection. There will be contributions on the analogous subject of coke-oven practice; and, in view of this, the President's paper on the question before the Institution of Gas Engineers in 1896, and that of Dr. Schniewind before the Gas Section of the International Engineering Congress in Glasgow in 1901, with the subsequent publications of information since in the "JOURNAL," will be useful in suggestion and for comparison purposes. The use of tar for road improvement will also be discussed; and this will give an opportunity, for the commercial benefit of the bye-product, of accentuating merit for this particular purpose, and doing something to assist in driving interest among those road authorities who sleep heavily in their contentment with old-fashioned notions under new conditions. Among the authors of papers will be a representative of the gas profession in Ireland.

From the information here given, with that supplied in a circular which the Secretary of the Institution (Mr. Walter T. Dunn) has issued on behalf of the Council, it is clear that the Council have arrangements well in hand that will only require to be supplemented by the loyal support of the members to their own central organization to make the meeting in every way an unqualified success. In settling the details of the meeting, the Council have the co-operation of Messrs. George Airth, R. Bruce Anderson, Francis T. Cotton, T. J. Reid (Ballina), and James Whimster; and it may therefore be taken, with such heads and local knowledge and influence assisting, that there will be a finished completeness about the plans and the proceedings—from the time that the Right Hon. the Lord Mayor of Dublin (Mr. Joseph P. Nannetti) welcomes the Institution in the name of the city. Special visits to the exhibition are projected, so that there will be ample opportunity for inspecting the exhibits, especially those in the Gas Section, and the lighting of the grounds. It is expected that the gas lighting, in the favourable situations secured, will be a big attraction. The social events will include an invitation to the members to a luncheon, by the Directors of the Alliance and Dublin Consumers' Gas Company, possibly on the second day of the meeting. There will also be a reception on the Thursday evening; and various excursions, to suit all tastes and desires, are being organized for the Friday. Every day will have its engagements. For those who are able to extend their visit beyond this, it is understood that arrangements are contemplated for an excursion to the

Lakes of Killarney—starting on the Saturday, and returning early the following week. The Council are also employed with negotiations at the present time which, it is hoped, will eventuate in a considerable saving being effected in the travelling expenses of members. This much can definitely be said in regard to locomotion about the city, that the Dublin United Tramways Company will issue free passes over their system throughout the meeting; and their generosity to the visitors will be much appreciated.

We cannot, with such a programme before us, look forward to the annual meeting with anything but pleasurable anticipation, and confident hope of an abundant success.

The Gas-Coal Position.

Reports from the coal-selling centres during the past fortnight have not been quite so confident in tone respecting gas and other coals as they had invariably been in the few immediately preceding weeks; and there are indications of a little easier tendency, although every endeavour is being made by the colliery proprietors to sustain their exorbitant prices. Present position and outlook appear to be more or less bright, according to the amount of polish that the ability of the market reporters enables them to put upon their descriptive statements; but, bringing judgment to bear upon discrepancies in this respect and in quotations, the conclusion is arrived at that, for some reason or other, the firmness and the still ascending views of a few weeks ago have been put in check. Requirements for coal have worn down considerably. With milder weather, householders are not so pressed for supplies, and are indisposed to pay the current high rates for stocking their cellars. The needs of gas manufacturers have also declined with the reduced hours of darkness; while in other industries, there has also been a shortening of demand. The colliery proprietors have, in fine, found that manufacturers can, if they are resolved to be firm, place the coal sellers in an ugly position, and affect their anticipated financial results. There is such a thing as the price of coal being so high that, with other heavy expenses still on the upward scale, manufacturers in some industries find it an economic advantage to restrict their output, and so curtail their financial outgoings. One of the market reporters in the "Iron and Coal Trades Review" recognizes the danger. He says: "Coal owners are having "the best of it now; and consumers are calling out loudly "about the abnormally high prices that are being demanded "by the sellers. *They are certainly a good deal out of propor-* "*tion with the figures that the consumers can realize for their* "*produce.*" This shows the direction from which will come the pressure that will assist coal owners to their senses, and to the retracing of their steps from the unwarrantable lengths to which they have gone.

There is not the same amount of boasting now that we had a few weeks ago regarding the justification of home influences. It is the foreign buyer who, we are now assured, is setting and maintaining a high level of price for home needs. The same frank reporter from whom quotation has just been made says that, "in a great measure, the high "prices are due to the extraordinarily good demand from "abroad for Durham coal and coke; and, as the foreigner "will pay the heavy prices that are quoted, naturally the "colliery people sell to those who will give them the best "rates." This is the answer to those who, from the camp of the coal interests, have been attempting, in the Daily Press, to take the edge off the protests that have been made in high places in the gas industry against the removal of the revenue-producing coal tax, and which removal has not in the slightest degree benefited foreign buyers, but has taken from this country a productive source of income. It has been asserted that the infliction of the tax was not, from the national point of view, an economic benefit—that through it whole villages have been put into a bankrupt condition, and that it has meant starvation for families and for the much oppressed village shopkeeper. The Board of Trade returns tell a different tale. They show that coal exports, instead of diminishing, have increased during the years that the tax was in operation, and that more coal was raised and carried. This condition, and the willingness of the foreign buyers to now pay extortionate rates for coal which put into the shade those paid during the run of the tax, and their eagerness to buy from this country, enable us to dismiss the answer to the protest from the gas industry as brainless and false. It is this demand from foreign countries, and the further application of the miners for a 5 per cent. advance (which has not yet been finally adjudicated upon by the Conciliation Board), that are being utilized—slender though they be—as props for the maintenance of current quotations.

With regard to gas-coal prices, the colliery owners have, up to the present, thought better of their rumoured intention to immediately push contract prices still higher. For prompt delivery, there have been small pence concessions from contract prices. Regarding those for Durham coals, at the end of last week, reported quotations stood at Middlesbrough at 12s. 6d. per ton f.o.b., and 12s. for seconds. But coal was not being so freely bought as during the preceding weeks at those prices. From Sunderland, it was reported that 13s. 3d. to 13s. 6d. were the figures that were being realized f.o.b. From Newcastle, 12s. 9d. f.o.b. was quoted. An easier feeling on the market was reported from Lancashire; but owners, it was stated, showed no signs of abating their demands. From Yorkshire came the intelligence that the colliery owners had no difficulty in disposing of their output at current rates, and were asking 10s. to 10s. 6d. per ton for screened coals, 8s. 6d. to 9s. for unscreened, and 8s. to 9s. for nuts. Undertakings in the Eastern Counties were reported to be doing a brisk business with Nottinghamshire sellers, at prices from 8s. 9d. to 9s. 3d., and for seconds at 7s. 6d. to 8s.

This summarizes the position, so far as it can be stated from available information; but the indications are that the pressure has passed that was first given out as the reason for the recent single big jump upwards from the prices being paid under current gas-coal contracts. Coal owners are, however, apparently trying to sit firmly on prices somewhere about those mentioned above.

London under New Management.

After the Borough Councils, the London County Council. At the beginning of last week, the ratepayers of the Metropolis awakened to the fact that at length they had effectually freed themselves from the thraldom that threatened to sap their vitality. The past apathy of the electorate has aided the Progressives and Socialists in their self-satisfying task of imposing the burdens of excess and mismanagement on the ratepayers. But the pace has been too fast; and the ratepayers have at length turned upon the maladministrators. They discovered that the so-called Progressives, instead of confining themselves to the efficient government of the purely public affairs of the Metropolis, were paying greater attention to giving impetus to the ball that the extremists had set rolling towards collectivism and communism. Thus it came about that towards the end of last year, the ratepayers effectively subjugated the Progressives and Socialists of the Borough Councils; and now they have put a finish on the work by exactly reversing the position of the parties on the London County Council. The new masters of the situation are pledged to produce economy in future by bringing the influence of moderation and efficiency to bear upon the immoderation of the past, and to restrain with a no uncertain hand the further monopolizing of powers over enterprise, for the management of which, both by constitution and experience, public bodies are disqualified. The old County Council were very conceited as to their self-sufficiency. This would have been merely humorous if momentous issues had not hung upon the decrees of that conceit. Results told a different tale as to sufficiency; but they carried no warning, and produced no sacrifice of a policy that yielded the results. Every fresh responsibility that was undertaken inured to some loss of efficiency throughout the work of the Council, to the further accumulation of debt, and to the necessity for increasing rates and assessments to satisfy financial obligations. The new Council have entered into a heritage of financial muddle, both extensive and ponderous; and it will involve time, labour, and much anxiety to make any impression upon it. The people of London ought to be very thankful to those who have undertaken the task, and who have given the guarantee that the old policy of cumulative obligation and debt shall be reduced to the efficient minimum. It is some satisfaction to be assured that the weight of the burden is now approximately known, and that, even if there cannot be any immediate descent, there will be no ascent due to future policy, whatever old commitments may bring forth. The Municipal Reformers (who have now a majority equal to that of the old Progressive-Socialist majority of the Council) must, in pursuance of their policy, drop the Electricity Supply Bill of their predecessors, which proposed the expenditure of many millions on an experiment

for which no trace of possible success could be found. The verdict of the polls was unmistakable; and we have now to look forward to the incremental results of the supersession of the impracticable by the practical, and blundering and irrationality by judicious management. The influence of this will without doubt spread throughout the country.

An Electrical Coup d'État.

Paris has furnished, with dramatic swiftness and effects, illustration of a fresh trouble to add to the already long roll of difficulties that beset constancy of electricity supply. In all places where an electricity service exists, between the generating-station and the carbons of the arc lamps, the filaments of the incandescent lamps, and the work expected of the electrical motor, the causes of interruption of supply are many and, as their repetition confirms, incorrigible. Therefore those who supply and those who use are always living in the unblest state of uncertainty. But mechanical and other derangements are not, as a rule, so sweeping in their results as when the whole of the electrical employees of a city or town league themselves, and, by concerted arrangement, simultaneously leave their work, with a view to enforcing their demands. That is precisely what happened in Paris on Friday. The city was unprepared for this; and it suffered hugely. Where gas had been disestablished, and where a temporary measure of relief could not be obtained by candles, oil-lamps, or torches, there darkness reigned. It was a new experience for the Parisians; and the Parisians, as is their wont, rejoiced over the novelty until it was worn away by increasing inconvenience. And the inconvenience was not long in being sorely felt. The dismal lights of oil-lamps and flickering candles were unequal in all cases to acting as deputies for electricity. Not only were streets and private houses deprived of illumination, but popular restaurants and cafés could not successfully conduct their business, music halls and threatres had to be closed, in offices and shops business had to be suspended, industrial and other concerns were suddenly brought to a standstill through the cessation of the energy required to drive their motors, and newspapers could not be printed. The electrical employees had awakened to the knowledge of the despotic power that the circumstances of electrical generation and distribution place in their hands; and they used it to force compliance with their requirements. The argument is certainly sharp and disastrous that they can bring to bear upon their employers' contentions in any matter of dispute or unsatisfied demand. By one pre-arranged stroke, the production of steam is stayed, the electricity generating machinery is brought to a standstill, and no current flows. It will be more perturbing than ever to suppliers and users to know that such swift and injury-dealing potency reposes through circumstance in the hands of the men. No such power rests with the labour of the gas industry. Between gas production and the consumer is the bulwark afforded by the gasholder; and in times of extreme dissension storage has tided over the period required for the re-manning of the works. Now that the electrical employees of Paris have put their power to the test by disturbing the nocturnal amenities of the city and its business and industry, that power has not, it may be feared, been used for the last time. Other electrical workers will not be backward in taking a hint from Paris.

Pontefract Arbitration Award.

The award of the Umpire (Sir Hugh Owen) in the Pontefract arbitration, which was made known at the end of last week, informs the Corporation how much they will have to pay for the acquisition of the Gas Company's undertaking. During the hearing last month, Mr. Forbes Lankester, K.C., for the Company, claimed 28·57 years' purchase, with the addition of 10 per cent. for compulsory purchase; the total being £89,016. Mr. W. A. Valon put in a valuation bearing out this figure; while Mr. H. E. Jones's total was very nearly the same—£88,781—and Mr. Henry Tobey also expressed agreement with the claim. For the Corporation, Mr. Wedderburn, K.C., called Mr. E. H. Stevenson, who said that he regarded £60,438 as a fair price to be awarded. He included nothing for compulsory purchase; and his valuation was worked out on a 4½ per cent. basis, as against the 3½ per cent. basis to which the Company's advisers urged that shareholders were entitled. This view was supported by Mr. John Wilkinson. One difference between the parties on which Mr. Wedderburn appeared to lay much stress when replying on the case, was the claim made by the Company in respect to loan capital. The whole of the loan capital authorized (£8000) was convertible into share capital bearing interest at not more than 5 per cent.; and it was maintained for the Company that it would be fair to regard 5 per cent. on this £8000 as profits which might be divided by the Company, beyond the maximum dividends on the share capital already raised. Mr. Lankester argued that if the right to convert the money borrowed was a valuable asset, then it ought to be paid for; while Mr. Wedderburn said that such a claim was "entirely new to him"—and "a strange and novel plan"—though he admitted that it had apparently been made in at any rate two other cases. Altogether, therefore, there was a pretty wide difference between the parties; and by the award of £69,600, the Corporation will have to pay about £9000 more than they said was the value of the undertaking, while the Company will receive some £19,400 less than they claimed to be entitled to.

The Distribution of Carburetted Water Gas.

Inasmuch as they have now got a definite answer, is it too much to hope that the agitators on the Liverpool Corporation who have been periodically directing their energies to securing the control of the distribution of water gas in admixture with coal gas will now allow the matter to subside? Nothing has arisen since the report of the Home Office Committee on the subject to justify Parliament in moving further in the matter; and the Liverpool Corporation have now been told so. The authorities at Westminster, we believe, have been well assured and persuaded that it is not the distribution of a percentage of water gas in the total supply, but, for the most part, gross carelessness and negligence, together with intentional self-destruction, that is the cause of occasional loss of life through gas poisoning or asphyxiation. The Liverpool Corporation, but no other authority, have been bestirring themselves for years in trying to induce legislation to control the supply of what they are pleased to call (so as to incite popular encouragement and support) "poisonous gas." Towards the close of last year, they endeavoured to get the Local Government Board to receive a deputation on the subject, said some nasty things in their own Council Chamber about carburetted water gas, and wrangled a little among themselves as to who should form the deputation. Their endeavours and words were wasted; for the Local Government Board politely informed the Corporation that the matter was not one for them but for the Board of Trade. This transference to another department has had no better success for the aspirations of the Liverpool Corporation. In the House of Commons, Mr. Harmood Banner, representing the Everton division of Liverpool, has questioned Mr. Lloyd-George on the subject; and the right hon. gentleman has told his interrogator that he has no intention at present to carry into effect the recommendations of the Departmental Committee. This is another way of saying that nothing fresh has been advanced to warrant him moving in the matter.

End of the Opposition to the Falmouth Gas Bill.

The decision of the Falmouth Town Council last week removes one more Gas Bill from the list of possibly contentious Private Bills in the present session. A few members of the Corporation appear to have been disappointed that the opportunity for a fight should have been allowed to pass; but the ratepayers as a whole are not likely to share this feeling. Little, indeed, was left to fight about after the concessions made by the Directors. The only point really at issue was whether a clause should be inserted in the Bill empowering the Corporation to purchase the undertaking. A few councillors with Progressive ideas were exceedingly anxious that this power of purchase should be vested in the Council, though there does not appear to have been any general expectation that it would or could be exercised. Some fifteen or twenty years ago the Falmouth Corporation succeeded in getting a clause of this kind incorporated in an Act promoted by the Company. It gave them the option of buying the works at any time within ten years; but though there was endless talk about it, the powers were ultimately allowed to lapse without being exercised. In the present case, the Engineers consulted by the Corporation have advised them that they could not expect a renewal of an option extending over anything like ten years, and that the utmost which Parliament was likely to concede

would be a clause authorizing the Corporation to acquire the gas undertaking within a year of the passing of the Act. They appear also to have informed the Corporation that such power was likely to be accompanied by a condition that the purchase of the works must be followed by their reconstruction on a new site. As the Corporation were anxious to force the Company to agree to the removal of the works from the centre of the town to the suburbs, they could not have resisted with good grace any condition of this kind which Parliament might have imposed on them. However desirable the removal of the works may be, the majority of the Council wisely concluded it was impossible for the Corporation to undertake the acquisition and transplanting of the undertaking in the immediate future; and the Bill will therefore go through with such concessions as the Directors have made. These are of a substantial character in the financial sense; and the gas consumers are likely to be better off under the Company's continued administration than they could possibly be under the Corporation if they had had to incur anything like the capital obligations which some members anticipated.

Another Inquiry at Nottingham.

Once more the "gas agitation" is claiming attention at Nottingham—this time, of course, in connection with the public inquiry which it was agreed some weeks ago should be held. The steps which led up to this decision will no doubt still be fresh in the minds of our readers; and there is therefore no need to recapitulate them. The inquiry was to be held by a Committee consisting of five members of the Council; and it was to be in connection with the working of the gas undertaking during the past five years. Subsequently, the Committee were chosen, with the Mayor at their head; and, as is reported to-day in the "Miscellaneous News" columns, the first meeting was held last Thursday. Strange to say, however (or is it strange, after all, perhaps—seeing how long drawn-out the agitation has been?), there was manifested but a very slight amount of general interest in the proceedings; the public, we are told, being represented by only about "a couple of dozen" at the outside. This did not, of course, make any difference to the proceedings of the Committee, who sat for three hours, and then adjourned, with the announcement that they would meet on two days this week. Only two witnesses were called on Thursday. Mr. F. B. Harris, the Assistant Solicitor to the Corporation, gave an historical survey of the undertaking (owing to the absence through ill-health of Sir Samuel Johnson, the Town Clerk); and Mr. J. H. Brown followed with some particulars regarding the plant. The inquiry is to be taken under four distinct heads: (1) Plant and distribution; (2) quality of gas; (3) method of obtaining contracts for plant, goods, and materials; (4) price of gas. This is a fairly comprehensive programme; and it will—seeing that each branch is to be taken separately—doubtless entail calling the same witnesses over and over again, as the different questions are taken in hand. By this means, the inquiry will be rendered more easy to follow, besides being simpler to undertake, than if it had not been so divided up. Whatever may be the outcome, there does not seem to be any reason to doubt, from the first day's proceedings, that the Committee are bent upon going as fully as possible into the matter. But how far they will be successful in their endeavours to clear up whatever mystery there may be, cannot depend entirely upon themselves; and in this connection it is significant that, in spite of advertisements inviting those who desire to give evidence to communicate with the Committee, the response has been of a most discouraging nature. No intimation has been received from the three members of the Council who gave evidence at the last inquiry as to whether they will come forward again; but perhaps it is as yet too early to altogether abandon the idea that these gentlemen may eventually determine to give public expression to their views.

Unfortunate Position of the Mond Gas Company.

The report of the Directors of the South Staffordshire Mond Gas Company for the year to December last (which was noticed in last week's issue of the "JOURNAL," p. 630), must have proved anything but satisfactory reading to the shareholders, inasmuch as not only was there no dividend forthcoming, but the balance on revenue account was very much on the wrong side. Manufacturers are, it seems, still shy about taking advantage of favours which the Company are only too anxious to confer upon them, with the result that the loss on revenue account for the twelve months amounted to the disconcerting total of £13,677. And this, be it marked, followed a debit balance of practically £9000 on the previous year's operations. At this rate of "progression," matters would seem to resolve themselves merely into the question of how long the Company can afford to continue working. But, in fairness, it must be borne in mind that the Directors are engaged in an uphill task; for, even supposing that all their claims regarding the economy of their process can be substantiated in practical working, it is needful to convince prospective customers of the fact—which must take time. That the progress made in this direction has been "grievously disappointing" the Chairman himself admitted to the shareholders—a feeling which, it is perfectly safe to predict, they fully shared. In spite of every effort, the output, we are told, has been little less than half the capacity of the plant; and of this, apparently, the South Staffordshire Mines Drainage Commissioners still take a portion—at a "special" price. It will be remembered that the previous year it was stated that these Commissioners were "not being supplied at a profit;" and perhaps the same might have been said of the past twelve months, for the Chairman remarked that "if all the gas had been sold at the average price received for that supplied to ordinary customers, their income would have been increased by nearly £11,000, and their loss reduced to about £4000." Figures supplied of a case in which a steam-engine had been replaced by one driven by Mond gas seemed satisfactory enough; and the Company themselves have erected furnaces at their own works to demonstrate their ability to do what they claim. But in spite of all this, as the Chairman remarked, "the manufacturers of the district have not shown that willingness to avail themselves of the advantages and economies that could be given them which would have been expected from business men." The shareholders will fervently hope that in the future these gentlemen will show a greater readiness to use Mond gas than they have done in the past.

The London and Southern District Junior Gas Association will hold a meeting at the Cripplegate Institute, E.C., on Wednesday, the 20th inst., when a paper will be read by Mr. E. W. Eldred, entitled "Public Lighting."

Gas Companies (Removal of Sulphur Restrictions) Bill.—As recorded in our "Parliamentary Intelligence," this Bill, which has been promoted jointly by the Bath, Blyth and Cowpen, Eastbourne, Scarborough, Tynemouth, West Ham, and Weymouth Gas Companies, has been read a second time and committed. The Committee of Selection had the Bill before them last Wednesday; and, there being no petitions against it, it was referred to the Committee on Unopposed Bills.

Association of Water-Works Engineers.—We have received the "Transactions" of the Society for the past year. The contents consist mainly of the papers read at the summer and winter meetings, held at Scarborough and in London respectively, with the discussions thereon. The proceedings on these occasions were fully reported in our columns at the time. The papers as now given are well illustrated. The other matter comprises the address of the President for the year, Mr. W. Millhouse, Assoc. M.Inst.C.E., the Water Engineer to the Scarborough Corporation (whose portrait is given as a frontispiece), lists of the Council, Past-Presidents, and officers, and a useful subject-matter index to the eleven volumes of "Transactions" which have appeared. The book has been brought out under the editorship of Mr. Percy Griffith, M.Inst.C.E., F.G.S., the Secretary of the Association.

Testing Gas-Meters.—It may be remembered that in the "JOURNAL" for the 27th of November last we published a report presented to the London County Council by the Public Control Committee on the subject of the testing of gas-meters. The Committee directed attention to certain defects of the Sale of Gas Act, 1859 (one being the absence of provision for testing the indices), and recommended that the attention of the Board of Trade should be directed to these defects, and that they should be asked to introduce this session a Bill not only to amend them, but to introduce fresh legislation on the following points: The reduction of the range of error permitted in meters to 1 per cent.; the provision of an effective method of stamping meters, with a view to the prevention of fraud; the power to a consumer to have a meter tested whether it be stamped or not; the revision of fees for testing *in situ*, and to cover the additional cost of testing the index; the simplification of the procedure in cases of appeal; and the periodical re-verification of meters. The Institution of Gas Engineers have had this matter under consideration; and the Parliamentary Committee have had the report above referred to reprinted, and are now circulating it among the members with a request to be favoured with an expression of any views they may hold with regard to the proposals contained therein.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 701.)

The Stock Exchange has had a most disappointing week. It opened well under the beneficent influence of the London County Council elections, though reflection reminded that the new body was inheriting the commitments of the old, and that no great economies are yet possible. But a strong wave of depression set in early from that prolific centre of disturbance, New York, where an almost unexampled struggle between the bulls and the bears raged in the Railway Market—the latter having the best of it so far. This produced a general feeling of uneasiness and apprehension over here, which affected more or less pretty well every department, from Consols and the choicest gilt-edged stocks downward. These last were also at some disadvantage, in view of approaching new issues. Altogether, it was a bad week all round right up to the close. In the Money Market, the opening tendency was easy under the influence of conditions which ruled at the close of the preceding week; but it gradually hardened, and closed firm. Discount rates were firm all along. In the Gas Market, there was a marked improvement in business so far as activity was concerned, though that seemed to be falling off somewhat towards the end. But the market bore up very well against the depressing influences around it, and there was hardly any change in values—only two quotations making a slight retrograde movement. In Gaslight and Coke issues, the ordinary effected a slight improvement on the figures it had stuck to so closely for some weeks past; and still maintaining $95\frac{3}{4}$ as its minimum, it touched 97 more than once as its maximum. More transactions than have been the average of late were marked in the secured issues. Dealings in the maximum were recorded at from $87\frac{1}{2}$ to 89; in the preference at from 106 special to 107; and in the debenture at $84\frac{1}{2}$ and $84\frac{3}{4}$. There was an increase of business in South Metropolitan; but the tendency was rather weaker. Transactions ranged from 125 to 123—a fall of 1 in the quotation. The debenture was done at from $84\frac{1}{2}$ to $85\frac{1}{2}$. Hardly anything was doing in Commercials. One deal in the 4 per cent. was marked at $109\frac{3}{4}$ (after some small parcels had been let go free at $107\frac{1}{2}$ for the 4 per cent.), $105\frac{1}{2}$ for the $3\frac{1}{2}$ per cent., and 83 for the debenture. The Suburban and Provincial group was as quiet as usual, or more so. Brentford old was done at 253, a small amount of Tottenham debenture at 101 free, West Ham at from 103 to 104, and ditto preference at $122\frac{1}{2}$. In the Continental Companies, business was moderate. Imperial changed hands at from 179 to $180\frac{1}{2}$, Union at from $122\frac{1}{2}$ to $123\frac{1}{2}$, ditto preference at 142, and European fully-paid at $24\frac{1}{2}$ and $24\frac{3}{4}$. Among the undertakings of the remoter world, Bombay was done at 7, Primitiva at $7\frac{7}{8}$, ditto preference at from $5\frac{1}{8}$ to $5\frac{3}{16}$, River Plate at from $12\frac{1}{2}$ to $12\frac{5}{8}$, ditto debenture at $96\frac{1}{4}$ and 97, Monte Video at $11\frac{5}{8}$, and San Paulo at $13\frac{1}{4}$.

The closing prices are shown in our list on p. 701.

ELECTRIC LIGHTING MEMORANDA.

A Pessimist on the New Metallic Filament Lamps—Their Development and Success said to Spell Disaster for the Electrical Industry—Drastic Measures Necessary—Suspicious Fires—Fuses not a Certain Protection—Unfortunate Failure - Fruitless Expenditure.

The last two weeks, electrical statistics and power supply have monopolized the space that could be spared for the "Memoranda." This week, we can return to general topics. Since attention was last drawn to the subject of metallic filament lamps, the "Electrical Times" has created mild excitement by publishing a couple of articles in which there is a great deal of solid truth about metallic filament lamps, with a plentiful interlarding of prophecy and warning. The line of argument, however, was somewhat overdone, and the dressing here and there a bit too sensational. The articles are written under the pseudonym of "A Lamp Maker." We do not know positively, but it seems to us that if "the voice is Jacob's voice, the hands are the hands of Esau." However that may be, it is positively stated that the metallic filament lamp has come to stay. Of this there can be no doubt. But the writer goes on with extreme vigour to prove that, so far as vision permits a survey to be made of the situation, the staying is going to be on a limited scale—that is to say, in this country. He says:

> The voltages at which at present the lamps, with one exception, can be run are comparatively low; and it would seem that many difficulties have yet to be overcome before they can be made suitable for voltages between 200 and 250. For one thing, the filaments appear to be as fine a gauge as seems possible of attainment, unless the methods of producing them are considerably improved. A difficulty consequently exists in raising the resistance of the filament sufficiently high to enable low candle-power lamps of this type to be made for use on ordinary circuits. Consequently, we find that, while several forms of metallic filament lamps are a commercial possibilty for 100 volts, the question remains as to whether this type of lamp can be made for equally low or, preferably, lower candle-power at the ordinary supply station voltages of 200 or more.

The lamps may find use in isolated places, and in street lighting on 200 volts, where there is no objection to using lamps in series. But we come to this, regarding the question from a general standpoint: If the lamps cannot be made for high voltages and low candle powers, they "will not come into startling prominence." Then, again, the difficulty in obtaining the best lighting effect downward, without adding complications in the shape of special shades or reflectors, and the fragility of the filament due to the fact that it is run at a temperature not far from its melting-point, will militate against it.

From all of which, it would seem that hope of surmounting the difficulties that beset the development of a "1 watt per candle" metallic filament lamp complying with all requirements is not strong within the electrical breast. The physical obstructions to progress to the desirable end for the consumers are many and obdurate. It is, however, obvious that there are not a few among electricians who ardently hope that the difficulties will continue to assert themselves. And why? "A Lamp Maker" replies:

> The advent of the metallic filament lamp spells disaster, sharp, sudden, and complete to our electric supply authorities, unless innovations are brought promptly into being to cope with the danger. . . . Increased use will balance decreased specific consumption? I am afraid not. The metallic filament lamp will be in extensive practical use before station engineers have grasped its import, and decreased current consumption will be confronting us long before the use of the light becomes so general as is anticipated.

That is an awful outlook; and, revelling in his apparently congenial task, the writer piles on the agony with a computation that, to bring about a balance of consumption, nine metallic filament lamps will have to be connected in place of every two at present on the mains. We turn aside from this dismal picture for the moment to a note in a subsequent issue of the "Electrical Times" in which it is stated that "one large building is saving £1000 per annum by using lamps of this type, and we have heard of station engineers who are taking steps to counteract these effects. In one case a four-light fitting, wired and fixed complete, representing a total candle power of 200, is to be supplied for £4 10s. per annum for 800 hours' use, and $1\frac{1}{4}$d. per hour for every hour exceeding 800." In other words, to preserve consumption, something in the nature of a little fraud is being practised on the consumer, to divert from him the purse advantage in relation to consumption, and give him an amount of light that in most cases he will not need. This is interesting; but it shows how strong is the instinct of self-preservation among some electricians, and how utterly repugnant to them is any gain of economy to the consumer. We must admit that in most cases lean returns will not allow great generosity.

But returning to the article, although radical innovations may not be brought promptly into being, the writer himself (though he does not appear to realize it) advances all the argument necessary to show that "disaster" will not come upon the electrical industry sharply or suddenly. The metallic filament lamp that possesses the virtue of such elasticity as the carbon filament lamp, has not yet arrived; and any change would be gradual, for consumers are not in the habit of scrapping before they are obliged, nor do they rush to pay heavier prices for lamps than those to which they have been accustomed. It was in the early nineties before the satisfactory incandescent gas-mantle came to hand; and still there are consumers who are realizing 2 candles per cubic foot of gas by flat-flame burners, whereas they could obtain 18 and more candles per cubic foot by the adoption of the modern scientific means of using gas, and thus save considerably on their gas bills. But the parallel of the incandescent gas-mantle is only part of the story. The electricity industry's sources of revenue have no comparison with the varied sources of the gas industry—such as cooking-stoves and gas-fires at lighting prices for gas, the slot gas-meter business (which has surpassed anything that the wildest flights of imagination had forecast), and the residuals business. Therefore, if the station engineer would save himself, "A Lamp Maker" advises him to do something drastic. What he regards as doing something drastic appears to be the use of overhead wiring for extensions, the adoption of something that looks much like jerry house wiring, the abolition of meters, charges on the basis of per lamp per annum, and, in fact, everything else that can be done to make the price of light so low "as to prevent gas competing on anything like terms of equality." It is a revolution that is advocated. But stay, there are a couple of other channels which he thinks promise hopefully. Motive power and heating must be popularized, at low prices. We have been labouring under the impression that the popularizing of electricity in these directions, and by the means suggested, has been going on for quite a long time. Now we read:

> Radiators are hardly known, and, where known, can hardly be used on account of either the cost of current or of special wiring. It is silly to speak of radiators costing about 1d. per hour to burn, when we know perfectly well that special wires and plugs have to be fixed, and a separate meter coupled up, before they can be used. If bought and fixed to the nearest circuit, as a man would fix a gas-stove to the nearest service-pipe, the cost of burning would be about 4d. per hour, or whatever the lighting charge was.

"A Lamp Maker's" method is to pull down the average revenue per unit; but he has overlooked what that pulling down process has done for some of the London Electricity Companies. He should ask the shareholders for information about the successive droopings of their dividends. But we come to the end of the articles, the cloak of pessimism is thrown off, and radiant optimism is found. It, however, all depends on the acceptance of the ways and means set forth. Then—oh! the glory of it—it will be

ound that "the very inventions which have threatened to destroy the business of electric supply have really ushered in the Golden Age of Electricity." The writer frequently slips into postulation, as is natural in dealing with the unknown; but in one place there is a bad slip, where he says that, through its average life, the gas mantle "is really not so greatly superior to the best form of fishtail burner." But in view of the remainder of his articles, we forgive the writer the untruth, or perhaps politeness requires from us that we shall still designate it a "slip."

Attention is once more called to the relationship between fires and electric wires. Dr. Waldo (City Coroner) and others have been talking over the matter in connection with the Wood Street fire in February, when damage—estimated at £80,000—was caused. This is the biggest fire that has occurred in the City since the Barbican outbreak in May, 1902. There have been some decent sized ones in the interim; and Dr. Waldo tells us that insurance rates for such warehouses as those in Wood Street have, consequently, gone up tremendously. The first information about the Wood Street fire in February last was that a Mr. Baker noticed "a dull red light" through a frosted glass door on the second floor of No. 12, Wood Street. But a porter declared that he left the office in question in perfect order, a few minutes after his employer had quitted it; and he also mentioned that a few years ago there was a "short-circuit fire, which was caused, so it was suggested, by a live wire touching the telephone wire during the installation of an electric radiator." This brought from Dr. Waldo the statement that he had heard, and had known, of some very suspicious cases in which electric wires were concerned. There seemed no doubt they constituted a danger of a kind; but it appeared that everything possible was being done to minimize the risk. Then followed this little conversation between a juror and Lieut. Sladen, the Divisional Officer of the London Fire Brigade at Euston: A Juror: "Do you find more fires now than before due to electric wires?" Lieut. Sladen: "Yes; five years ago there were only twenty a year, whereas last year we had over 150." A Juror: "And that is due to the increase in electric lighting?" Lieut. Sladen: "Yes, certainly. I recommend that the wires be carried through metal tubes." While the jury returned a verdict to the effect that the fire was caused by some means unknown, they also recommended that all electric wires should be encased in tubes. Touching this question of fires, there is a word to say about the prevalent idea that fuses are the great safeguard against fires occurring through any fault in an electric installation. This is not right; and "Electricity and Electrical Engineering" owns up to it. Within a certain range of contingencies, fuses are certainly safeguards, and obviously indispensable; for instance, against the overloading of leads and against short-circuits. But, our contemporary candidly says, they are not a protection against all chances of fire. Some of the most insidious of faults can still do damage and yet, possibly, not blow the fuse, either at all or too late. These are in regard to bad connections. And one of the most usual places where such faults occur, especially where the wiring and fitting have been carried out in a slipshod manner, is in connection with the switch-wires.

The electric light is no respecter of persons. It is, however, too bad that the light should make its best friends suffer. No one could work more incessantly in its interests than the Editor and staff of the "Electrical Review." But in the issue of that paper for March 1, we came across the following: "As we go to press with our last pages, our electric light has gradually faded away. First the Nernst ceased to glow, at 12.10; the carbon lamps maintained a feeble glimmer for half an hour longer, and then gave up the ghost. We are now writing by the light of a tallow candle, stuck on a cocoa tin. We thought the Charing Cross Company welcomed foggy days! Our neighbours on the City Company's mains are more fortunate." We can only express our deepest sympathy, and regret that such a bad choice of lights should have been made by our journalistic friends.

The story of the abortive electricity scheme for Sudbury, Suffolk, over which muddle supervened upon muddle, has been told in the "JOURNAL." The Ratepayers' Protection Association have lately issued a statement showing the details of the expenses incurred through this interference by misguided amateurs (misguided, as the issue of a legal case proved) in such a complicated and speculative business as electricity supply. The total amount of the expenses was £1225; and Mr. Hawtayne's professional services are entered at £500 out of that sum! Sudbury can ill-afford to spend £1225 without getting some return for it; but perhaps it is better to have spent £1225 without return than many thousands of pounds on a white elephant. Sudbury may prove—we hope it will—a salutary warning to other country towns.

Southern District Association.—We learn from the Hon. Secretary (Mr. A. F. Browne) that the annual meeting of the Southern District Association of Gas Engineers and Managers will be held on Thursday, the 21st inst., at the Hotel Cecil. In addition to the general business and the inaugural address of the President (Mr. H. W. Woodall, of Bournemouth), a proposition will be submitted for an alteration to Rule 22. At present this rule reads: "Each member of the Association shall be furnished annually by the Secretary with a copy of the regulations, and with a list of the names and residences of the members;" and the object of the motion is to omit the words "with a copy of the regulations and." At the conclusion of the meeting, the annual dinner will take place.

OBITUARY.

We regret to learn that Mr. CHARLES E. SANDERSON, who had been connected with the "American Gaslight Journal" since the beginning of 1870, and had for some years been its business manager, died at his residence in Brooklyn (N.Y.) on the 20th ult., in his 61st year.

Mr. EDWARD WARD, who had been 22 years in the service of the Salford Gas Committee, and who had risen to the position of foreman of the Regent Street and Albion Street works, recently died at the age of 69. His funeral was attended by Mr. W. W Woodward, the Chief Engineer, Mr. Hartley, the Assistant-Engineer, and other officials, besides a number of the workmen.

The death occurred recently of Mr. WILLIAM JAMES HARRIS, of Sittingbourne. Deceased, who was 73 years of age, had been Secretary of the Sittingbourne Gas Company and the Rainham Water Company, and he was the senior Coroner for Kent. He had passed 53 years of his life in the service of Sittingbourne; and there was scarcely a public authority or institution in which he was not directly or indirectly interested.

We regret to record the death on the 2nd inst., under painful circumstances, of Sir FREDERICK WIGAN, Bart., one of the Directors of the Cagliari Gas and Water Company, whose meeting is reported to-day. The deceased baronet came to town from East Sheen to vote in Southwark in the London County Council election; and while so engaged he was seized with sudden illness in Redcross Street, Borough Road. Assistance was promptly summoned, and he was conveyed to Guy's Hospital, where he died without recovering consciousness.

The death occurred recently of Mr. WILLIAM AUGUSTUS MITCHELL, who was known from 1880 to 1890 as the "Benzol King." He was the head of the firm of Messrs. W. C. Barnes and Co., of Hackney Wick, and was well known in the coal-tar products industry, especially in the departments of benzol and aniline. According to the "Chemical Trade Journal," he was son-in-law of Mr. W. C. Barnes, who was the first distiller of pure benzol, toluol, aniline, and toluidine, and also the first to make nitro-benzol and aniline on a large scale in this country. The late Mr. Mitchell was in his 62nd year; and he leaves a widow, four sons, and four daughters.

The death occurred recently of M. HENRI MOISSAN, the distinguished French Chemist. Born in Paris in 1852, he studied at the Museum of Natural History, and in 1879 was connected with the School of Pharmacy, where he became Professor of Toxicology in 1886 and of Mineral Chemistry in 1889. In 1900 he was appointed Professor of General Chemistry at the Sorbonne and also Director of the Institute of Applied Chemistry. One of the earliest achievements that brought him fame was the isolation of the element fluorine in the free state—a problem which had attracted the attention of many chemists before him, though with little success. He will be best remembered by our readers in connection with his investigations into the capabilities of the electric furnace, on which he published a book—"Le Four Electrique"—in 1897. By the aid of this furnace he succeeded in melting a great number of substances which had previously been regarded as infusible, and in reducing, with carbon, refractory oxides such as lime and silica to their elementary state. He was also able to prepare many new compounds, especially carbides, silicides, and borides, including calcium carbide, which was obtained almost simultaneously by him and by Willson in America in 1892. The success of these investigations led to the establishment of the acetylene lighting industry. Professor Moissan was well known in England.

THE LATE MR. WILLIAM SUGG.

The Funeral Ceremony.

A COMMON sorrow, affection, and regard caused a large congregation to assemble at the Church of the Ascension, Balham Hill, early last Tuesday afternoon, where was rendered the first part of the solemn rites attending the laying to final rest of the body of him whom we have all revered in life, and shall continue to revere though removed from our midst—William Sugg. The widow and children of the deceased and a large number of other near relatives were present. Represented in considerable numbers, too, were the staff and employees of the firm that had sprung from the intellectual gifts of the now departed head, for whom—the kind and generous master that he was—the staff and employees had deep-seated regard. One who could claim having been Mr. Sugg's contemporary in the hard work of the gas industry farther back in the years that are dead than any other person present at the church was Mr. G. C. Trewby; and appropriately there sat with Mr. Trewby one of the present-day chief officers of the Gaslight and Coke Company—Mr. H. Rayner the Secretary. The neighbouring great Gas Company were represented by Mr. Charles Carpenter and Mr. Frank Bush; and the Institution of Gas Engineers by their Secretary, Mr. Walter T. Dunn. No doubt various other organizations with which Mr. Sugg was identified had delegates present; but anyway (as will be seen) other bodies were represented later at the cemetery.

Clergy and choir, at the hour appointed, received the coffin (which was almost completely hidden by its wealth of floral tribute) and the chief mourners at the main door of the church. As the procession passed up the central aisle, the beautiful hymn was sung—

Let saints on earth in concert sing
With those whose work is done.

The words of the second line lingered, and thoughts rushed back over the long period of steadfast and successful work, carried from stage to stage with the times—the achievement of one day supplying the point from which to commence the next—by him whose voice was now still, whose brain and hand were now inactive. The service was a choral one; and throughout earnestness, sympathy, and sorrow mingled and pervaded the sacred place. The first part of the service ended, the *cortège* proceeded to Streatham Cemetery, Tooting; and there, again, were found many wishful to pay their last respects. At the graveside, the service continued. Near by stood Sir George Livesey—almost life-long friend of Mr. Sugg, and constant admirer of his genius. With the President of the Southern District Association of Gas Engineers and Managers, and likewise W.M. of the Evening Star Lodge (Mr. F. W. Cross), were the Secretary of the Association (Mr. A. F. Browne), and the Secretary of the Lodge (Mr. W. D. Child). At the conclusion of the service, after the family had departed, many peered down the grave with its evergreen decked walls. The bright name-plate on the coffin was visible; and it bore the inscription, "William Thomas Sugg, Died Feb. 28, 1907. Aged 74 years." It was a long life, well and actively spent. The talents bestowed fructified abundantly for the gas industry, and those whom the industry serves.

THE LATE MR. WILLIAM YOUNG.

The Funeral—Handsome Bequest to the Town of Peebles.

The funeral of the late Mr. William Young took place at Peebles last Tuesday afternoon; and it was attended by a large gathering of friends of the deceased from far and near. Among those present were Sir Henry Ballantyne (Provost), and the Magistrates, Councillors, and Burgh Officials of Peebles, and the following Gas Managers: Messrs. W. R. Herring, of Edinburgh; A. Bell, sen., of Dalkeith; A. Bell, jun., of Peebles; A. Waddell, of Dunfermline; J. W. Napier, of Alloa; W. Brown, of Lasswade; S. Glover, of St. Helens; Levi Monk, of Lewes; and John Hammond, of Eastbourne. Among the general public were Mr. James Milne, of Messrs. James Milne and Son, Limited, and Messrs. G. T. Beilby, of Glasgow, J. Dennis and D. Brown, of Dalkeith, and J. Gordon Mason, S.S.C., Mr. Young's Law Agent. The coffin—a handsome oak one—was surmounted by rich floral tributes. Service was conducted, both in the house and at the grave, by the Rev. James Dewar, Baptist Minister in Peebles. As the *cortége* wound its way through the streets, the remains were respectfully saluted by the inhabitants of the burgh, among whom Mr. Young had spent the evening of his life. The obsequies were, in accordance with Scotch custom, of the simplest character.

Mr. Gordon Mason has intimated to the Provost of Peebles that Mr. Young has, by will dated Sept. 7, 1905, directed that (on the death of his son) the farm of Harehope, in the parish of Eddlestone, together with the stock, implements, &c., thereon, shall be conveyed to the Provost, Magistrates, and Town Council of Peebles, as Trustees, for the purpose of founding a sanatorium or hospital, to be called "The Harehope Sanatorium," for the treatment of persons suffering from phthisis. Inasmuch as the income or revenue to be derived from the farm and lands may not be sufficient for the immediate erection or maintenance of the sanatorium, the testator has conferred power on the Town Council to accumulate the revenue for such period as they may consider necessary to provide a capital sum sufficient to yield a suitable revenue. He has also directed that the conditions and regulations to be prescribed and adjusted by the Town Council for carrying out this trust shall contain provisions that the benefits of the sanatorium shall primarily, and as far as possible, be applied for the benefit of persons who may not be able to pay all or any part of the cost of residence and treatment therein, and that, in the case of selecting from persons who may apply for residence and treatment therein, and who may not be able to pay all or any part of the cost thereof, preference shall be given first to persons resident in the burgh, and secondly to those in the county of Peebles. In his will, Mr. Young has explained that it occurred to him, while resident at Harehope, and experiencing the benefits to be derived therefrom, that from its equable temperature, due to its southern exposure, dry subsoil, and sheltered position, it would be a most suitable situation for a sanatorium or hospital for the treatment of persons suffering from tuberculosis, consumption, or other disease or diseases of the lungs, and that he had observed and felt deeply sorry for those suffering from such diseases, who might have been greatly relieved or cured by residence and treatment in such a sanatorium, but who could not pay for it.

The estate of Harehope is beautifully situated on the road from Lyne to Eddlestone. The present yearly rental is £300; and the value of the stock, &c., included in the bequest, is estimated at £2000. Needless to say, the intimation of the bequest has given rise to feelings of the highest gratification in the town and district.

"TIT-BITS" FOR GAS ENGINEERS.*

The new edition of Mr. O'Connor's "Pocket-Book," which lies before us, presents a strange medley, culled from many and varied sources—some acknowledged, some unacknowledged. If only its would-be user should be competent to sift the wheat from the chaff, and will not object to engaging in the sifting process, he may be glad to have the book beside him in place of one or more less comprehensive or pretentious, but more uniformly trustworthy, works of reference. The general form and appearance of the pocket-book are in its favour, and the first 140 odd pages of general mathematical tables are (so far as we have applied checks) reliable. Square roots and cube roots of the numbers from 1 to 1000, however, are stated to the third place of decimals, and in a great many instances the last figure is not the nearest to the correct value. For instance, the cube root of 89 is given as 4·461, whereas it should be 4·465. The corresponding tables in two well-known pocket-books which we have looked up for the sake of comparison are free from these errors. The tables of logarithms to six places also occasionally show small errors.

Tables of thermal data crop up at intervals in this and subsequent parts of the book, and there is a great deal of duplication and, we are sorry to say, contradiction. For instance, on page 98, the specific heat of phosphorus is given as 0·288; on page 336, as 0·2503. Zinc is ascribed four different melting points on as many different pages. The boiling point of "mercury" differs by 14° Fahr. from that of "quicksilver" in the same table! The specific heats of gases as given are curious in several instances; but it will suffice to point out that that of "marsh gas" is identical with that of "light carburetted hydrogen" at "equal pressure," but widely different at "equal volume." We have now, however, said enough to indicate that when the purely mathematical tables are passed, Mr. O'Connor's book is not reliable nor even consistent with itself.

The later pages, dealing with the construction of gas-works, and the manufacture of gas, largely comprise disjointed paragraphs of information of varied utility and trustworthiness. Among the tit-bits here presented may be quoted the following: "Test for naphthalene.—Redden liquor with nitric acid supersaturated with muriatic acid. If naphthalene be present, it will tinge a piece of firwood a deep purple." "One per cent. air has no effect on illuminating power." "One per cent. of common air diminishes the illuminating power 6 per cent." "Calcic carbide is liquefied at 32° Fahr. by a pressure of 21½ atmospheres."

The pocket-book (which contains a comprehensive index) concludes with a reprint of the regulations made for testing gas in the Metropolis, as revised to August last. Looking through the volume, one notices that Mr. O'Connor names his authorities in many cases. To some he prefixes "Mr.;" others are without it; while Sir George Livesey appears several times as "Mr."

* "The Gas Engineer's Pocket-Book: Comprising Tables, Notes, and Memoranda relating to the Manufacture, Distribution, and Use of Coal Gas and the Construction of Gas-Works." By Henry O'Connor, F.R.S.Edin., Assoc.M.Inst.C.E., Past President of the Society of Engineers. Third Edition, Revised. London: Crosby Lockwood and Son; 1907.

THE ELECTRICAL TRADES' DIRECTORY.

We have received from the "Electrician" Printing and Publishing Company, Limited, of Salisbury Court, Fleet Street, the "Electrical Trades' Directory and Handbook"—familiarly known as the "Big Blue Book"—for the current year. This is the 25th year of publication, and every possible effort has been made to bring the contents of the present edition close up to date. The volume includes complete notes of the year's progress in electric traction, electric power, and the applications of electric driving to industrial works. The progress made in electric lamp improvements, &c., is also set out; and a complete summary is given of the parliamentary work in the past session, so far as legislation has affected the electrical industry. The law of electric lighting, power, and traction is fully dealt with; and in a digest specially prepared by Mr. A. C. Curtis-Hayward, A.I.E.E., Solicitor, the principal legal decisions of the High Courts in 1906 affecting the electrical industry are fully considered. The subjects of patent law and expiring patents, of rules for the installation of electric light, power, and traction in this country, the fire risk rules of all the leading Fire Offices, as well as those which govern electrical installations in the United States, Germany, France, Switzerland, and other Continental countries, and also in the British Colonies, are included in the volume. Full financial details relating to electrical joint-stock enterprise, and information referring to the financial side of every branch of the industry, are to be found, including a Directory of Directors of Electrical Companies, particulars of the capital authorized and issued, the last dividends paid, the latest Stock Exchange quotations, the principal officials, &c. The "Directory Division" contains the name and address of every person engaged in the electrical profession and industry throughout the United Kingdom, his telephone number and telegraphic address; and a separate list of telegraphic addresses (alphabetically arranged) is included. There is also a "Biographical Division," giving interesting sketches of the careers

of the leaders of electrical engineering enterprise at home and abroad; and a complete obituary for 1906. The book contains a graphic survey of the engineering and electrical equipment of all the electricity supply, electric power, and electric traction undertakings of the kingdom in the form of five compact tables, the details furnished being very comprehensive. One of these tables is devoted to Colonial undertakings of the same character. There are in all more than 2000 pages in the "Directory," and certainly there is no slackening of the Editor's efforts to keep up the high reputation of the work, the price of which is 15s. net, exclusive of postage.

EXPERIMENTS WITH INCLINED RETORTS AT GUILDFORD.

Some Further Results.

When Mr. G. R. Love read, at the last November meeting of the Southern District Association of Gas Engineers and Managers, his interesting paper on the experiments at Guildford with vertical and inclined retorts, there was an eager desire on the part of the members to know more, and an equally earnest desire on the part of Mr. Love to continue the trials if opportunity allowed, so as to fortify the opinion he had formed as to being on the right track for securing a further increment of productive advantage from the carbonization of coal. Opportunity has favoured; and the experiments have been prosecuted. It will be remembered that, in these trials, Mr. Love set out from the horizontal retort, and went at once to the vertical. but he eventually retraced his steps, and found himself exploring carbonization by means of retorts set at an angle of 45°, and fed continuously by a series of vanes from an overhead hopper. The gases were led off at the upper or charging end of the retorts; and the coke was discharged at intervals of one-and-a-half hours at the lower end. Owing to the short length of the retorts (only 10 feet), the coke, under this system of working, contained a large percentage of breeze, due to want of compression.

That is, generally speaking, the point at which we had arrived in Mr. Love's experiments as recounted (with the results) in his paper. From this stage, Mr. Love began charging the retorts—a bed of eights, of length and angle mentioned—full at one operation; and the first satisfactory result was that the trouble with the coke was found to be overcome by this mode of working. Therefore, for a number of weeks, the continuous arrangement of charging has been discarded; and the filling of the retorts in one charge has been the method constantly worked—the charge remaining in the retorts twelve hours. We learn that the results realized by working in this way have been, put generally: 13,000 cubic feet (estimated) per ton of second-class Durham coal. The coke has averaged 13½ cwt. per ton. The quantity of tar is considerably less than under ordinary working—about half; while the quantity of ammonia is greater than with horizontals. The coke is of the foundry coke type—showing in section that the gases are driven from the outside of the mass to the centre. The section of the coke has, in fact, quite a tree-like formation. No thick tar is observed; what tar there is being of a light oily nature. There is an entire absence of choked ascension-pipes; and the hydraulic main is always in a liquid state. The temperature of the gas immediately over the mouthpiece is 450° Fahr., about half way through the period of charge; whereas the temperature the same distance from the mouthpiece of the horizontals, taken at the same time, is 750° Fahr. From this one bed of inclined 10-feet eights, so set and so worked, Mr. Love realizes as much as he is able to do from fourteen of his horizontal retorts—that is to say, from seven 20 feet throughs. He puts about 8 cwt. charges in each retort every twelve hours; and in his horizontal retorts, he only charges, in the same length of retort, 3 cwt., or 6 cwt. in each 20 feet retort, in twelve hours.

These are the salient and extremely interesting results of Mr. Love's continued trials; and every point suggests matter for consideration and discussion. We hope for further good news.

LUMINOUS ADVERTISEMENTS.

Luminous advertisements have become very popular in commercial circles, as anyone can judge by a walk at night time in any of our cities and towns. The reason of this is that no one can come within seeing distance of such advertisements without being attracted by them, and watching for the development of the word or notice. Hundreds of persons pass by hoardings bearing printed advertisements without as much as turning their eyes to see the nature of the announcements; but not so with the luminous advertisement. It has a kind of magnetic influence that compels attention. In large measure, electricity has taken possession of this field; but gas is making a bid for supremacy, even in this direction, in the matter of cost and of equality in regard to convenience and effect. In the "Journal" for Oct. 16 last, allusion was made in our "Register of Patents" to a method of flash-light advertising by gas invented by M. Maurin, of Paris; and last week the actual thing was shown in use at No. 36, King William Street, E.C., where it is on exhibition. The controlling mechanical portion of the arrangement is of a very simple and ingenious character; and after witnessing a demonstration, its effectiveness can be certified. There is a small gas-tight tank into which the gas feeds, and in this is a wheel worked by the inflowing gas, which puts in motion a cylinder fitted with keys, which, at predetermined times, raise (we will call them) feeding-pipes which convey the gas to the pipes supplying the burners. The open ends of the feeding pipes drop into liquid, and so they are hermetically sealed. When a pipe is raised by one of the keys, the open end comes above the liquid, and the gas enters it, and so passes to the burner or burners placed behind the sign, where it is ignited by the bye-pass jets, which are continuously fed with gas by a separate pipe when the sign is in use. When the key releases the raised feeding-pipe, the mouth of the latter drops back again into the liquid—thus discontinuing the supply of gas and extinguishing the light. The invention, it will be gathered from this, is capable of all sorts of variations to meet the requirements of advertisers. The apparatus is made in four ways: (1) The whole word appearing, and then disappearing in one colour. (2) The whole word appearing, and then disappearing in two colours. (3) The word appearing letter by letter, and then disappearing. (4) The word appearing letter by letter, and then disappearing in two colours. With regard to working cost, the inventor gives the following as a basis of comparison: Gas used in No. 1 apparatus (four burners) 8 cubic feet per hour, cost about ¼d. Electricity, to show the same word, would require an average of at least three bulbs per letter, say twelve lights of 8-candle power each, consuming 0·3 unit, which would cost at 2d. per unit (say) ¾d., at 3d. 1d., and at 4d. 1¼d. With gas, using flat-flame burners, there is no cost for upkeep; whereas with electricity there is the constant liability to breakage of bulbs or fusing of wires, and the expense and annoyance of repairs. There appears to be nothing about the apparatus to get out of order; and the only trouble involved is the lighting of the bye-pass jets at the start, and then the turning off of the main service-tap to the sign when the display is finished. The apparatus can, of course, be made in any required size.

Another "Circular of Inquiry."

In the "Journal" for the 19th ult. (p. 461), we called attention to a revival of the attempt to get professional information "on the cheap," by means of a circular of inquiry which had just been brought to our notice. Within the past few days, we have received evidence, in the shape of a letter accompanied by a string of questions, that the trouble persists. The parties responsible for the control of a certain gas undertaking had under consideration the question of the price of gas, in view of the large increase in the cost of coal; and, in order to assist them in their deliberations, they requested their chief official to ascertain any particulars that might be useful. He accordingly sent round the following questions, with a request that they might be answered, and an assurance that any information given would be treated as confidential.

1.—What is the present price of gas charged by your company? Are any, and, if so, what, discounts allowed?
2.—What is the present price for gas charged by your company when selling gas by slot meter?
3.—What is the average price per ton paid by your company for coal?
4.—Out of what fund does your company provide the cost of the slot meters? How many slot meters have you in use?
5.—Does your company provide free fittings? If so, out of what fund is the initial cost provided? Is any rental charged?
6.—Does your company supply incandescent mantles at a reduced price to consumers?
7.—Is the lighting of the public streets supplied by your company?
8.—Do your directors contemplate raising the price of gas in view of the increased cost of coal? If so, in what direction?

There are two points about these inquiry circulars. One is that the parties who draw them up appear to be either unaware of the existence of parliamentary returns and other statistical literature, or prefer to get other people to write out information that they could readily obtain from reliable published sources. The other is the absurdity of promising to treat information as "confidential," when it is to be passed round for the perusal of members of a board or a committee, one (or possibly more) of whom may be more interested in coal or the labour question than he is in the gas industry. In the case under notice, the inquirer not only wished to have written information as to what many would be inclined to regard as the private affairs of the company whose official he circularized, but also as to the secrets of the board-room. A secretary could scarcely answer the last question without committing a breach of trust, seeing that he is not supposed to repeat anything outside the board-room, unless instructed to do so; and it is evident that there is a limit to the extent of information that any official is entitled to give, on his own authority, as to the finances or practices of his company.

Congress of Heating and Ventilating Engineers.—It is announced that the sixth annual congress of heating and ventilating engineers has been fixed to take place in Vienna on the 3rd to the 6th of June next, under the patronage of the Austrian Minister of the Interior, Baron Richard von Bienerth, and the Prefect of Lower Austria, his Excellency Count Erich von Kielmansegg. All interested in the progress of methods of heating and ventilation are cordially invited to attend the congress, of which full particulars can be obtained on application to the headquarters at 16 Seilerstätte, Vienna.

EXTENSIONS AT THE ENFIELD GAS-WORKS.

An interesting piece of reconstruction and extension has been recently completed at the Enfield Gas-Works. The carbonizing plant at these works consisted of two retort-houses, joined end to end; the oldest being a ground-floor house containing twelve beds of sixes, set back to back, with direct fires. The newer house was a stage-house one, with eight beds of nines.

It was decided to replace the direct-fired settings of sixes with regenerative fired settings of eights: and it was found that a bench containing fourteen beds of eights could be accommodated. But it was first necessary to raise the roof, and also at the same time to widen the house so that it should be possible to introduce machine-stoking in the future whenever this should become economical.

The alteration was carried out as shown in the illustration; the roof being carried on cantilevers supported in their turn by steel stanchions. These latter were designed to take the whole horizontal component of the wind pressure on one side of the house; the roof-shoes on the other side being provided with a sliding bearing, to allow for expansion.

A charging-floor was constructed at the same level as that in the adjoining house; and the retort-arches having been completed, regenerative settings of the type associated with the name of Mr. W. A. Valon were installed. Similar settings were already in use in the adjoining house, but working with a common shaft for the whole bench; whereas in the new work each setting has its own separate chimney.

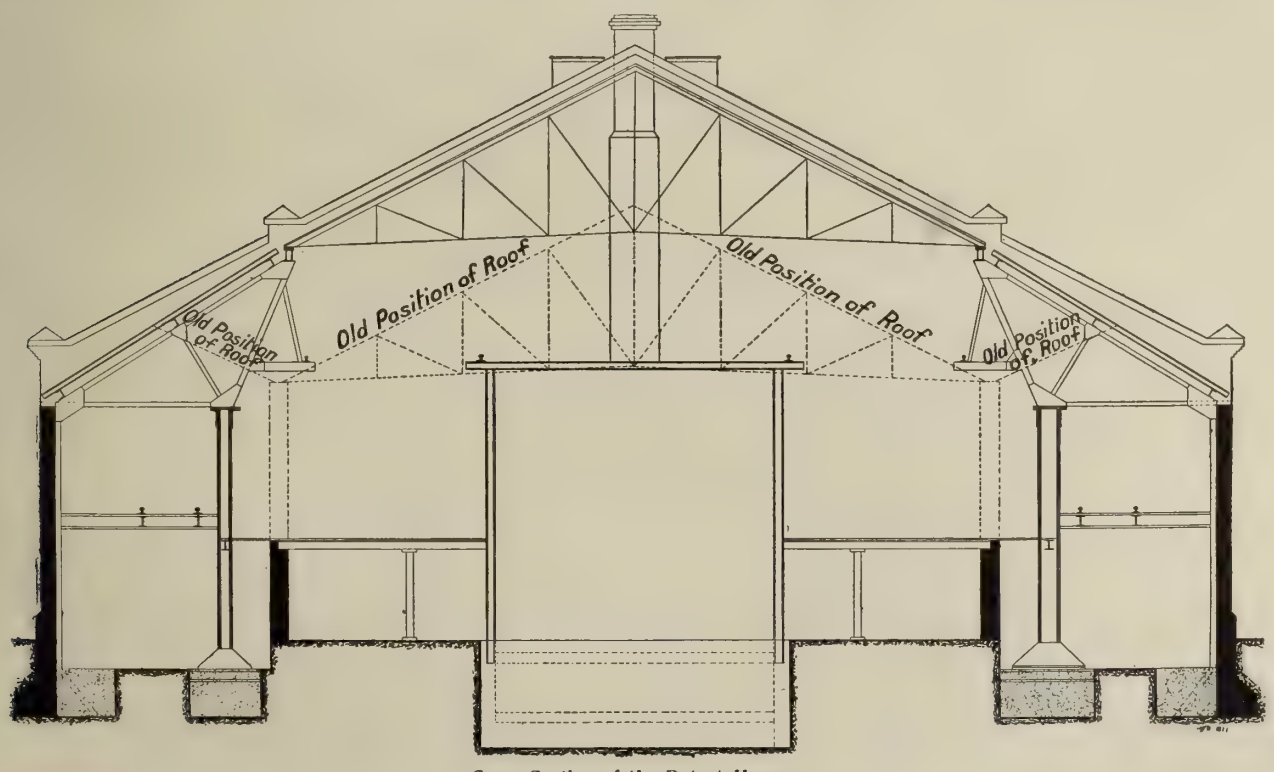


Reconstruction of the Enfield Retort-House.

This work having been finished, it was decided to widen the other house in a similar manner, and to remove the division wall —throwing the whole into one house. This was satisfactorily accomplished; the roof being transferred direct from the wall to the cantilevers without taking down the principals or even stripping the roof.

The whole of the work was carried out to the designs and under the supervision of the Company's Consulting Engineers, Messrs. W. A. Valon and Son.

The improved working achieved by having regenerative settings in both houses, in place of one section regenerative and one section direct fired, has completely realized expectations. Compared with the results obtained previous to the remodelling, the gas produced per ton of coal carbonized has been increased by 1240 cubic feet; the coke and breeze available for sale per ton of coal has increased from 10 to 10·8 cwt.; the tar made per ton of coal has increased by a gallon; and the carbonizing wages have been reduced by 1·14d. per 1000 feet of gas sold.



Cross Section of the Retort-House.

THE SITUATION IN THE THORIUM INDUSTRY.

By Dr. C. Richard Böhm, of Berlin.

In an article of which a translation appeared in the "Journal" for Feb. 13 last year (p. 430), I endeavoured to show the position of the monazite business, which is of the highest importance to the thorium industry, and hence to that of incandescent gas lighting, being as these are inseparably connected one with another. I concluded the article by expressing the wish that the natural regulator of prices—supply and demand—and free competition might soon lead to healthy relations, so that the most recent development of technical chemistry might attain to its full importance for trade and illuminating purposes. Soon after the article appeared, came the rapid fall in the price of thorium nitrate from 53s. to 27s. per kilo., which forms an interesting subject for examination in regard to the speculative activity of the German Thorium Convention. As the Convention informed their clients of this fall in price in a brief circular, without any comment, there were naturally a large number of explanations in circulation as to the motive for the sudden drop. One explanation was that as the contract of the Convention with the monazite sand suppliers, Gordon and De Freytas, would run out on July 1, 1907, they wished, by means of the fall, to bring about healthier conditions by a renewal of the contract. This conjecture, however, is very improbable, as the Convention by such an action would lay themselves open far too easily to the danger that Gordon and De Freytas would enter into relations with the outsiders. The supposition is more likely that, by a sudden depreciation of their stock of the raw material, they would drive their competitors out of the field. In any case the effect of the sudden drop rapidly made itself felt. The proprietor of quite a small thorium works at Rixdorf, near Berlin, worked out his stock quickly, sold everything that had any value, and "vanished in the night," as was pertinently reported by a daily paper. Similarly, many firms outside the combine suspended manufacturing operations until further developments, but still delivered thorium nitrate for 26s. per kilo., since they bought up larger quantities from the Convention, in order to maintain their business connections, and gain time for buying-in cheaper raw material.

The recognition of this act of liberality did not fail to appear; for mantle manufacturers made use of the opportunity to no small extent, since they bought up mantle residues everywhere, and, with few exceptions, only obtained thorium nitrate against exchange. The dimensions to which this collecting mania had attained are shown by the fact that dealers went from shop to shop buying up waste mantles in the smallest quantities. There are even wholesale dealers who had as much as 100 kilos. of waste mantles, and who obtained their material from all parts of the world.

It is generally well known that the Convention had to pay a high price for their monazite sand, and, in consequence of the active pursuance of the mantle waste business, had in the past year a very bad time as regards thorium nitrate. It is further known that several mantle manufacturers made money quickly and without trouble; for they speculated in thorium nitrate, and in 1904 had greater balances. The surplus quantity of thorium could not be worked up, and it could not be employed for other purposes without considerable loss. It thus came about that during last year large quantities of thorium were placed on the market, and many mantle manufacturers received in exchange more thorium nitrate than they were able to make use of. These residual quantities were to be had for 42s. to 45s. per kilo. in 500 kilo. lots until the end of 1905. In the early days of last year, 300 kilos. of Convention thorium were offered for as little as 38s. Under such conditions, is it to be wondered at that the Convention could only with greater trouble sell their nitrate for 52s. or 53s. per kilo? According to Bruno,* no large manufacturer has paid the price fixed by the Convention. These prices appear only to have been on paper.

A third explanation is that the last step of the Convention can perhaps be directed against the Deutsche Gasglühlicht Gesellschaft, which, by means of its known indirect connection with the Gemania chemical works (which formerly only obtained their monazite sand from the Convention in such quantities as the need of their friends, the Exportgasglühlicht Gesellschaft in Weissensee demanded), made sure of its own supply of thorium. As the important mantle works of Richard Feuer and Co., in Schöneberg, near Berlin, were bought up by the Deutsche Gasglühlicht Gesellschaft, and the Exportgasglühlicht Gesellschaft belongs to this Syndicate, the Germania chemical works have probably had to deliver thorium nitrate for these three large mantle factories, and will accordingly do considerable damage to the Convention. Herr Feuer had, however, early taken this circumstance into consideration, and looked about for other sources of monazite sand. He managed, through a Paris firm, to import sand from the interior of Brazil. The working up of this sand is carried out, as in Brazil, by the aid of the Humboldt machine.

By means of the reduction in the price of thorium nitrate, the Convention contrived to put the Carolina monazite sand, which was formerly worked up by a few outside firms, quite out of the question for the present German thorium industry, since the concentration of the sand is saddled with considerable expense; besides the situation—which is far in the interior—necessitates increased transport charges. With a price for thorium nitrate of 50s. to 53s., the outsiders could still pay £75 per ton for a 5 per cent. sand. The monazite sand deliverers also still had a balance of profit. But matters are altogether different when the price of thorium nitrate sinks to 26s. and 27s. per kilo. The Convention get their 5 per cent. sand from Messrs. Gordon and De Freytas for £28 15s. per ton. For such a price as this, Carolina sand cannot be delivered; and therefore Carolina sand as a source of monazite sand for Germany is quite excluded. The American companies, who obtain their sand from Carolina, will also, under present conditions, be able to compete in America with the Convention, since, as is well known, there is a comparatively high import duty on thorium nitrate.

In order to prevent the outside firms from manufacturing thorium nitrate out of waste mantle ash, the Convention availed themselves of a means which displays evidence of little logic. They exchanged every kilo. of waste mantle ash, which had a value of 50s., for 1¼ kilos. of thorium nitrate, and by so doing themselves reduced the price of thorium nitrate from 50s. or 53s. to 40s.

The sudden drop in price of this material was, at all events, a very serious blow for a number of concerns—above all for the outsiders, who possessed, besides mantle waste bought up at high prices, more or less heavy stocks of nitrate. It even placed in jeopardy the existence of many of the firms. The thorium crash illustrates once more the power, as well as the danger, of the cartel. A further consequence of the cheapening of thorium nitrate was that the retail mantle dealer was requested by the manufacturers to lower the prices of these articles. Where this request was not actually made, the competition between the manufacturers all the same brought about a sharp cutting of prices. The man, therefore, who dealt in large quantities of thorium came into a decidedly difficult situation. The case was somewhat better for those manufacturers who had settled with the thorium ring, as the so-called "bottom-price clause" stood them in good stead.

It will be remembered that these probable developments incited a few firms in the incandescent mantle trade to summon a meeting, at which, in particular, the price manœuvres of the Thorium Convention were discussed; and the question was raised of a ring being formed between manufacturers of incandescent mantles. At a meeting held in Berlin on Jan. 24, 1906, 45 firms in the mantle trade assembled to bring about a settlement in price. However, a long, and at times very lively, discussion produced no result. Still another reason for the drop in price was the new find of thorium earth in Japan, corroboration of which, however, is still wanting. In the same way the latest discoveries in Queensland, Tasmania, Southern Nigeria, and the Transvaal, all turned out to be too poor in thorium earth. The Transvaal monazite sand was reported in many daily papers to contain 13 per cent. of thorium earth; but, after the most careful analysis, it was found to contain only 2·5 per cent.

The following facts may be considered as reasons for the sudden drop in the price of thorium nitrate: (1) The quickly organized business in the exchange of mantle ash; (2) the over-production of thorium nitrate; (3) the ever-increasing advance of Carolina monazite sand; (4) the decidedly disagreeable and appreciable competition, not only in Germany but also in America and France; (5) the recently developed system of combine between the mantle manufacturers, and the creation of their own thorium works. These factors together may well have placed before the Convention the alternative of undertaking a last deal, in order to avoid a still smaller sale in thorium nitrate manufactured from monazite sand than in the past year. This act I consider only as a forlorn hope of the ring, which made Gordon and De Freytas powerless, as their hands were bound in so far as only thorium manufacturers belonging to the combine have to decide the price of thorium nitrate.

The calculation of the Thorium Convention was also perfectly right, as what they wanted to attain they have attained—namely, the exclusion of the outsiders as suppliers of thorium, and the capture of practically all the German thorium supply. Of course, these results were bought at a loss of profit. Whereas formerly the manufacturers in the combine made about 15s. to 17s. per kilo. of thorium nitrate, they now only make about 7s. to 9s.* The loss of about 8s. per kilo. is, however, easily borne when one considers that the combine have made sure of almost all the German trade. The losers by this deal are only the Americans, Gordon and De Freytas, as they lose their portion of the profit (which was reckoned from 27s.), and are obliged to deliver monazite sand for £5 15s. per cent. per ton.† That this did not please the Americans is easy to see. On this account a split occurred in

* See "Zeitschrift für Beleuchtung" (Berlin), Vol. XII., p. 40.

* 27s. per kilo was accepted as cost price, the difference between 27s. and about 48s. went in three parts; hence the manufacturers made about 7s. The real cost price of thorium nitrate, however, is not 27s. per kilo., but 17s. to 19s. The profit of the manufacturers in the Convention therefore amounted to 8s. or 10s., and, in addition, 7s. After the price of thorium nitrate was reduced to 27s., they made only the difference between the actual cost price and 26s., as 3 per cent. discount was given on the 27s. Therefore their profit amounted to 7s. or 9s. per kilo. Since September, 1906, a new basis has been taken, which comes appreciably nearer the real cost of production of the thorium nitrate.

† The expression "£5 15s. per cent. per ton" means that the price of monazite sand was £5 15s. for each 1 per cent. of thorium earth. A sand containing 5 per cent. of thorium earth was, therefore, delivered to the Thorium Convention for £28 15s. This price is likely to rise somewhat in the early future.

the Convention immediately after the drop in prices—one group wanted to raise the price again, the other desired to set it still lower than 27s.

In order that the mantle manufacturers shall not again speculate in thorium nitrate and cause over-production the following year, Gordon and De Freytas have put an obstacle in their path, as they only permit such a delivery of thorium nitrate as will satisfy their actual annual need. In this way, Gordon and De Freytas now control the thorium market, and therefore their monazite sand depot in Hamburg. On this account, the explanation given by Bruno, that the outsiders had made contracts with the Convention to get thorium nitrate at 26s. per kilo., in order to remain in connection with their customers in view of the above arguments, can only appear as a false step.

Now that we have thoroughly studied the past and present of the thorium market, we will just take a glimpse into the future. To-day all who are interested in the matter ask the question as to how long these unhealthy relations will last—whether the former price of 53s. per kilo. will not soon be replaced, and whether the already sickly Convention will not fall to pieces. It is not to be thought for a moment, as matters now stand, that the Convention will survive. Possibly Gordon and De Freytas will enter into relations with rising firms for the supply of monazite sand, as these two (Gordon and De Freytas) must in time form an alliance. The thorium manufacturers of the combine will not ride so high this year, but must also take their present enemies—at least, the larger ones—into the combine; so that a great Syndicate for monazite sand and thorium nitrate will arise.

The following argument certainly bears out this acceptation: The Convention recently allowed Gordon to deliver 500 tons of monazite sand to the Deutsche Gasglühlicht Gesellschaft for £50 per ton (5 per cent. of thorium earth). This means that the Auer combine appeared too strong for the Convention, as they had entered into a hard fight with them. Moreover, the Convention will have felt a pang of remorse, as since the fall in the price of thorium nitrate their monazite sand suppliers had to work without profit, as at £5 15s. per cent. per ton nothing at all remained for Gordon and De Freytas after taking into account the high expenses and tariff. It was therefore nothing more than right that Gordon, after a long time, could again make a little pile of £12,500. The Deutsche Gasglühlicht Gesellschaft willingly paid £50 per ton, since their deliveries of mineral from the interior of Brazil were behind, owing to a dispute with their Paris middlemen.

In well-informed circles, it is an open secret that the Convention is ready to give way and gradually bring about healthy relations. By their delivery of 500 tons of monazite sand to the Deutsche Gasglühlicht Gesellschaft, they have shown a willingness to do so. To whom the German Convention will now confer their great favour is the question. In the same way it is also a question of how high the price of thorium nitrate will rise if the expected combine for monazite sand and thorium nitrate has been founded, possibly even higher than 53s., certainly it will not be lower. A rise in the price of thorium nitrate was, therefore, not altogether unexpected; so that a recent circular issued to the individual manufacturers did not cause surprise. It was here made known that the Convention had decided to raise the price of thorium nitrate by 5s. per kilo.—that is to say, from £1 7s. to £1 12s.—and that no contracts could be made beyond Dec. 31, 1907. It is, therefore, not at all unlikely that the price will still rise higher. Considering that lately the other raw materials used in manufacturing incandescent mantles—for instance, yarn—have also got dearer, it may safely be assumed that in the coming season incandescent mantles will experience a rise in price.

Then, also, one must not leave out of consideration the Brazilian Government. As Carolina is not productive enough, Brazil has in the meantime no competition to fear. So long as this is the case, the thorium industry will be dependent on Brazil. As Brazil needs money perhaps more than any other country, its Minister of Finance would be very shortsighted if he did not take the fullest advantage of the present situation of the incandescent gaslight industry. The contracts with Gordon and De Freytas will not prevent him carrying out his intention. He will find some way or other to conclude new contracts with exporters. It is already stated that now the law case, in which the Federal Government were successful, is over, these two parties—the federal and provincial governments—have come to an agreement, by virtue of which an export duty of £100 per ton is to be placed in future on monazite sand derived from the deposits belonging to private owners. We should, therefore be face to face with a monopoly of Marinhas sand. This acceptation is borne out by the fact that Gordon and De Freytas are exporting from Brazil as much monazite sand as possible. They are also taking precautions to prevent the fact from being observed in the import lists, by importing into Germany by various ports. They have already 10,000 to 12,000 tons in stock in Hamburg. When it is remembered that the manufacturers made an annual profit of £20,000 to £30,000, the question is involuntarily asked in Germany, Why were these manœuvres of the Convention necessary? They will probably only cost money for the consumers, while foreign countries get the benefit.

At the meeting of the Metropolitan Water Board last Friday week, the salary of the Clerk (Mr. A. B. Pilling) was increased by £250 per annum as from the 1st prox.

FIRST IMPRESSIONS OF AMERICA.

By A. J. B. Little.

I have been travelling since the 26th of January, *viâ* New York and Philadelphia, and left the latter city on the 8th of February; and, as first impressions are often correct, I give mine, in the hope that they may be interesting to readers of the "Journal."

Lighting Methods in Philadelphia.

In Philadelphia, which ranks in population, in the United States, next to New York and Chicago, the gas supply is in the hands of the United Gas Improvement Company, who were granted, in September, 1897, a lease for ten years. As this will expire next September, attention is now being drawn to the terms on which the Municipal Council can bring it to an end. Prominent citizens say that possibly the great stir going on arises out of a desire to find a fighting cry for the new candidates who are endeavouring to get a four-years election to the Council; but, in any case, the whole atmosphere is darkened with the stir and dust of these "new brooms." Coming from the other side of the Atlantic, one hoped to keep clear of the municipalization fever; but if this has not reached the epidemic state prevalent in England, it is none the less very insidious in its efforts, especially with reference to the gas question in Philadelphia. The conditions are hardly parallel to those obtaining in England, as the following facts indicate. When the Company took over the gas-works, they agreed to pay the city 10 per cent. of the amount received from the consumers; and in the nine years during which the lease has been in force, they have paid over no less than £890,000, and the amount has steadily increased from £40,000 to £142,000 a year. Whether for use as a "plank" on the party platform or really in order to terminate the lease, the Council now give notice of their desire to clear out the Company. But to do this the city will, according to the agreement, have to refund all moneys spent for the "alteration, enlargement, betterment, and improvement of the buildings, apparatus, machinery, mains, pipes, services, connections, meters, appliances, and appurtenances of the Philadelphia Gas-Works." The claim of the Company is for upwards of £4,122,000. The Committee of Investigation will not agree to any such sum; and the Company will not accept the finding of the Mayor's Committee. The latest development of the case is a reply by Mr. Dolan, the President of the Company, to a letter sent by Mr. Weaver, the Mayor. I give the unreasonable reply in substance.

In his letter, Mayor Weaver advised the Company as to the appointment of three gentlemen as a Commission under a resolution of the Council, and asked "What arrangements can be made for the Commission examining the books and papers bearing upon the question [*i.e.*, the accuracy of the claim for £4,122,000]; and also whether any person connected with your Company, desired as a witness, will appear before the Commission upon their request that he is wanted." In answer to this, President Dolan said they had complied with the provisions of the lease by filing a full annual statement with the Controller of the City. "Examination, auditing, and verification have been made under his supervision by two or more of his appointees, who devoted in each year about three months thereto." It would be thought that the accounts thus presented, verified, and accepted would be taken as conclusive; but, as in England so it is in the States, the Council now insinuate that they have not had fair play, and wish to go through the whole of the accounts for the past nine years. To show how open the Company are, however, though a re-examination of the books is not within the rights of the Council, they, stipulating that they will not recognize the finding as binding upon them (or, as you would say, "without prejudice"), are entirely willing to permit the representatives of the City to examine the accounts, books, and vouchers covering the expenditure, and, further, to allow the Commission to examine the buildings and plant. This, then, is how things are being worked by the municipal authorities of Philadelphia; and a great deal of party capital is being made out of the incident by would-be councillors, who are trying to catch votes.

Electric Lighting of the Streets and Railways.

Having shown the inner workings of the gas question, I will make a few remarks as to the way in which the matter affects the citizens. Knowing this to be the home of electric lighting, one expects to find the streets lighted by arc lamps. But, bearing in mind the boast of Americans, a feeling of disappointment creeps over the sightseeing Britisher when he first examines by night the result of years devoted to improving electrical appliances for street lighting. In the first place, the carbons burn in transparent globes, and as the lamps are close to the ground, the effect on the eyes of pedestrians is trying in the extreme. It is accentuated by the fluctuations in voltage, which are, of course, more noticeable with the glow-lamps. But for the lights provided by shopkeepers for interior show purposes, the pavements would be dark indeed, even though at the period of which I am writing there had been a 15-inch fall of snow, which had become solid by frost and remained white, and thus acted as a grand natural reflector. What a contrast it is to stand near streets lighted respectively by electricity and gas, as one can do in some parts of the city! Though the ordinary pressure of gas is employed, the incandescent gas-mantles, mounted in cylindrical globes fixed on neat

pillars, make a very effective show, and serve the purpose of guiding pedestrians in a way the glaring and stuttering arc lights cannot aspire to. Especially noticeable is the favourable contrast of gas lighting if a train is taken from the Reading Terminus of the Pennsylvania Railroad to a suburban station a few miles out. At the terminus, the light is provided by enclosed arc lamps with a sprinkling of glow-lamps; and to a stranger seeking a train on a certain platform the task of steering his way in the gloom is almost terrifying. On the outlying stations, on the contrary, the ordinary "C" burners and Welsbach mantles make one's progress easy and safe, notwithstanding the rapidity with which a train pulls up and draws out of the station. In the trains, gas lighting is in use, except on very long runs of (say) two days' duration, when electric lighting is the method adopted. But here again gas-jets are provided, and not merely for show, as one can see by surreptitiously turning on the tap and applying a light. A similar arrangement is in use in hotels where the electric light is employed for interior illumination. On all sides can be seen elaborate brass fittings with holders and glow-lamps; and one is astonished at the ingenuity of the designers, who in nearly every case manage to arrange a convenient tap, globe-holder, and gas-jet above the electric lamp. These also are not for show purposes only, as the gas is lurking behind each tap ready for use when the electric light fails; and nearly everywhere a thoughtful management has made rules to ensure that in proximity to the jets a full box of matches shall be kept in readiness.

Another point that may be touched upon is the frequency of fires in the city, in most cases traceable to crossed electric wires. Quite recently, a large mansion was burned down through this cause, and art treasures of priceless value, including paintings by old masters, were lost. In one day there were as many as seven fires, more or less serious; and one in the centre of the city was only subdued after a number of firemen had been injured, and most of them had had their clothes frozen stiff upon them.

Good Business in Gas.

In passing through the Harrisburg and Pittsburg districts, a great deal was heard of shortage of gas. In a number of cases, large works had been shut down compulsorily through lack of coal gas, and thousands of men were consequently thrown out of work for a day or two. In other cases, the supply would fail early in the morning, and workers had to go out after partaking of a cold breakfast, leaving the family shivering at home if they could not find relief at the houses of friends in other parts of the town. Such a condition is regrettable; but when one considers that it is in some cases the outcome of an increased demand for gas amounting to 60 per cent. per annum, those who are in charge of gas interests may be excused the abnormal state of affairs.

Summing up, one would say, after a cursory examination of the gas supply in Philadelphia, that it is entirely satisfactory so far as it goes; but it will take time and a lot of hard work to oust the electric light from the business portions of the city. The gas is of excellent quality, and the needs of the consumers are cared for in an admirable manner both by the Gas Company and the makers and vendors of fittings and supplies. Taking as an example the show-room of the Welsbach Company, one sees that for artistic quality and soundness of manufacture, the reading-lamps and ceiling and wall fittings are equal to, and possibly even surpass, what one has been accustomed to in England. But, on the other hand, one is immediately struck by the absence everywhere of neat and useful gas stoves and fires, such as meet the eye everywhere in the Old Country. An object-lesson is provided in places where electric light and gas both have an innings, as, without fail, in places where an unsurpassable light is needed for accurate work, there the inverted "Bijou" incandescent gas-lamp is always in use, while alongside it the electric glow-lamps remain in the cold. I have already alluded to the fluctuations in the voltage. I can say further that a lowering takes place at least every 15 minutes; and it is most trying to both temper and eyesight. It is when the light fails altogether, however, that the trouble begins; and this it does by no means infrequently. To give one instance, large works were thrown out of gear for many minutes by the outgoing of all electric lights, and, of course, heavy pecuniary loss resulted.

Heating of Dwelling Houses.

In conclusion, a few remarks may not be out of place on the much-vaunted system of heating the houses by hot water and steam radiators. After reading the advertisements of makers, and hearing the condemnatory remarks made by Americans regarding our open-grate fires, it may be refreshing to hear the other and true side of the story. In some cases a regulating-tap is fixed which can be used to turn the supply on or off the radiator. After sitting in the public rooms of the hotel for some time and getting far too warm in the dry atmosphere, at a temperature maintained at about 75° Fahr., one goes to a private room and turns on the supply. To one not used to the arrangement, a fright is the result, as the valve starts chattering like a colony of monkeys, and keeps up the performance for about ten minutes. When once in operation, the agitation in the box of tricks is not so violent; but all night long there is kept up a splutter and gurgle of the heating agent and a creaking and murmuring of the joints which, to say the least, is slightly distracting. In a great number of things the citizens of the United States are better served than Britishers; but in heating and lighting they are far behind, and must "hustle" to make up leeway.

TARRING ROADS AT AIX-LES-BAINS.

In a recent number of "Technique Sanitaire," M. Luya, the Municipal Engineer of Aix-les-Bains, gave an account of a piece of road-tarring work carried out by him early last year. In view of the competitions instituted by the Roads Improvement Association, to which several references have been made in the "JOURNAL," the particulars furnished may be of interest.

M. Luya commenced his experiment by selecting what was probably the worst material in the country for tarring roads—viz., a soft, friable quarry limestone, costing 4 frs. per cubic metre delivered on the spot, compared with 14 frs. for hard stones (quartzites) and 5 frs. for harder river pebbles. His choice was guided by the consideration that if a bad material, treated with hot tar, behaved well when in use, and formed a solid road, it could be employed economically, instead of expensive hard stone, in side roads. The saving effected made it possible, without increased cost, to treat hard stones for use in roads in which there was considerable traffic, and render them more durable. Accordingly, in the rainy season, when it was difficult to find work on the roads for the municipal employees, it was thought that they could be usefully occupied in tarring stones, under cover, by means of one of the ordinary tar-boilers and two wire-gauze baskets, each capable of containing from 45 lbs. to 65 lbs. of stones. A bulk of something like 42 cubic yards of stones was treated by dipping them into the hot tar for five minutes, so that each stone could be well coated. The tar used was at the rate of 220 lbs. per cubic metre (1·3 cubic yards), whereas for similar work carried out at Zurich only one-fourth of this quantity was employed. The tar was obtained from the Aix-les-Bains Gas-Works at the high price of 75 frs. per metric ton (2200 lbs.); and the labour involved cost 2·81 frs.

In the spring, the stones which had been treated as described were utilized to ballast a thickness of about 4 inches and a length of 55 yards of roadway, which was covered with sand and solidified by a steam-roller in the ordinary way. The rolling made the tar rise to the surface of the road, which then had the appearance of newly-tarred ballast. After six months' use, the road surface was intact, and there had been no trouble with dust or mud. During the first few days, it was somewhat spongy; but afterwards it became hard and resisting, but not slippery—the stones appearing in mosaic on the surface. The roadway consisted of an impermeable tar concrete, which retained its good condition in all weathers. The result was so encouraging that it was decided to treat another road, having a gradient of 6 to 7 in 100, in the same way, but with harder stone.

M. Luya concludes his article with a few remarks on the surfacing of the highways at Aix-les-Bains last summer, when about 2200 square yards of roadwork was carried out. When it was commenced, there was a general outcry against it, both on account of the time of year selected, when the thermal springs are much frequented, and the odour arising from the tar. But as soon as the good results were recognized, work had to be restricted to the amount allowed in the estimates, and not carried out to the extent demanded by the residents. The tarred roads withstood the effects of six months of exceptionally dry weather; and they were much appreciated. So great was the change of opinion, that the Municipal Council included in the budget for the present year an amount sufficient to cover the cost of tarring upwards of 100,000 square yards of roads, avenues, and streets throughout the town.

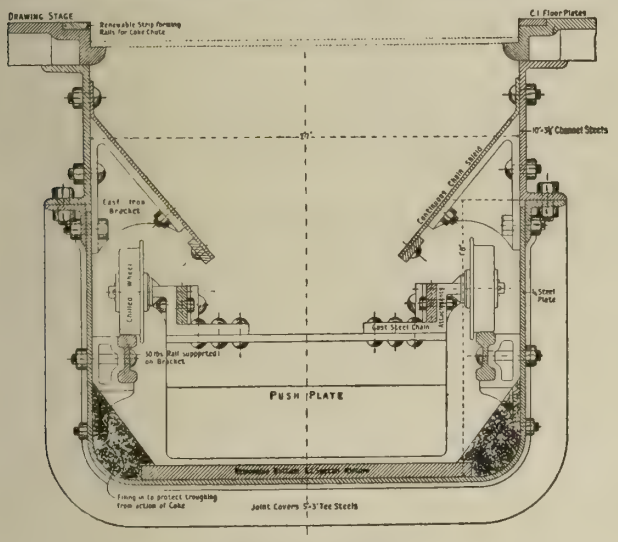
Large Bye-Products Works Suggested for Italy.

The Editor (Sig. Vittorio Calzavara) of "Il Gaz" has, in a recent issue of his paper, launched a suggestion for a large central bye-products works, which might serve as the gathering-ground for many gas-works which at present do not work up their bye-products to the extent that he thinks they might. He points out that gas has now to meet a continuous and daily struggle among many and various competitors. Nothing to strengthen the gas industry can one afford to overlook. In the early days of gas lighting, such competitors as we have to face were undreamt of; and our forefathers made gas in perhaps too empirical a way. But, in their defence, it must be remembered that the science of chemistry was then only in its early stages. Now, with our more profound knowledge of it, many gas bye-products can be more thoroughly worked up than ever before. Sig. Calzavara is evidently impressed with what he has seen done in this respect in a tour in England, particularly as regards tar. He also refers to the examples of France, Switzerland, and Germany. In the last country he saw three works, one of which got from its tar a commercial product different from the other two. He thought that, as in Italy the production of tar was limited in gas-works, if several of these combined and sent their tar to a central depôt, it could be thoroughly worked up there, and fewer products would then have to be imported. He promises further consideration of the suggestion, and the publication of more details in due course, when practical questions have been discussed. He states that there is not at present in Europe such an establishment as he proposes, but that there is one in America and also one in Japan. It will be of interest to observe the development, if any, of this idea, which has more than once been put forward.

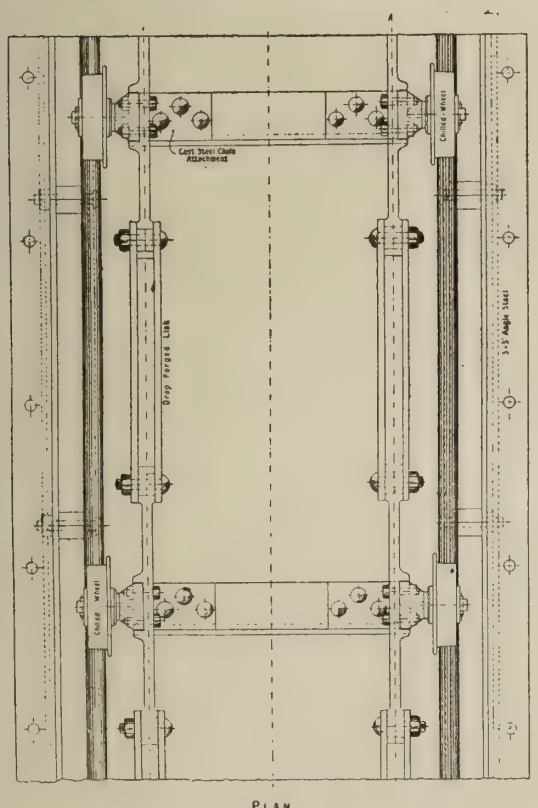
MR. HERRING'S NEW PUSH-PLATE CONVEYOR.

Towards the close of the paper on "Elevators and Conveyors," read by Mr. W. B. Leech at the recent meeting of the Eastern District Section of the Scottish Junior Gas Association, and noticed in another part of the "JOURNAL," the author referred to a new push-plate conveyor for hot coke which had been devised by Mr. W. R. Herring, and introduced at the new gas-works of the Edinburgh and Leith Gas Commissioners at Granton. The appliance is shown in the accompanying illustrations.

As users of double-chain conveyors are aware, the unequal expansion and contraction of the two chains is apt to bring about a slackness, particularly when dealing with long lengths. This slackness sometimes causes one or both chains to ride the



SECTIONAL ELEVATION OF PUSH PLATE CONVEYOR FOR HOT COKE.



Herring's Push-Plate Conveyor.

sprocket-wheels, and throws the conveyor temporarily out of gear. In order to obviate this inconvenience, Mr. Herring introduced powerful coil springs at the trailing end, so as to maintain a reasonable tension on the chains. This was found to be of considerable advantage, ensuring as it did the free and smooth working of the conveyors. But it was not a sufficient safeguard during holiday times. To remedy this, the return chain, for a portion of its length in the centre of the retort-house (subsequently altered to the exterior), is made to run free of its guides, so as to take up the unequal expansion of the double chain when alternately transmitting hot coke or returning empty. At Granton the chains are each more than 1000 feet long, and are subjected to extreme changes of temperature. Mr. Herring says the springs at the trailing end, though very effective, required some personal attention in order that the adjustments on the tension screws might be properly carried out. This was not only a cause of some expense, but was also a variable quantity at holiday times. Mr. Herring therefore decided to adopt the expedient mentioned; and by allowing 30 or 40 feet of the chain to sag, it took up its own variations in length, and maintained a fairly regular tension on the springs at the trailing end. Nearly twelve months' experience of the device has fully established its efficacy.

CALORIMETRY, AND THE MEASURING AND TESTING OF PRODUCER GAS.

At a Meeting of the London Section of the Society of Chemical Industry yesterday week—the CHAIRMAN (Mr. R. J. Friswell) presiding—Professor C. V. BOYS, F.R.S., exhibited his gas-calorimeter, explained the lines of reasoning he followed in its construction, and generally described the instrument. Succeeding this, Professor R. THRELFALL, F.R.S., submitted a paper on "Five Years' Experience in Measuring and Testing Producer Gas."

The Boys Gas-Calorimeter.

Professor Boys explained that the time available for him that evening would not admit of his reading a paper giving a full account of his gas-calorimeter, nor was there any occasion for such a paper being presented, as the calorimeter had previously been fully described by him.* But he understood that many of those present that evening would be glad to have an opportunity of seeing the instrument in operation, and of having its mode of working demonstrated. Referring to one of the calorimeters on the table before him, which had just been started as for a test, and to a sectional diagram of the instrument on the wall, he proceeded to indicate the more important differences between it and the earlier general type of gas-calorimeter. He said that when, in accordance with the new requirements of Parliament as to gas-testing in London, it became necessary for the Metropolitan Gas Referees to prescribe apparatus for determining the calorific power of the gas, he had, as the representative of physical science on that body, to study closely the subject of gas-calorimetry. He found that the well-known Junkers calorimeter was an excellent instrument; but it had certain inconveniences which he set out to overcome in devising a new calorimeter.

It was necessary with the Junkers calorimeter to jump up and down steps in order to make alternate readings of the thermometers; and the outlet-water thermometer was not so steady as could be desired. Also a good deal of time elapsed after lighting up before the outlet water had attained its final temperature. He therefore started to design a calorimeter in which all the thermometers should be at one level, so that the observer could read them all from the same position, and in which there should be no parallel routes for the circulating water, of which (he added later) the volume contained within the instrument should be as small as possible. The final result of his efforts was the calorimeter before the meeting. In order to bring about the transference of heat from the products of combustion to the circulating water as rapidly and completely as might be, he had availed himself of the wire-wound pipe, invented by T. Clarkson for motor-car radiators, for the circulation of the water. He had given up the bunsen type of burner commonly used in calorimeters in favour of a pair of Bray's No. 3 union-jet burners, set with the flames parallel, and had thus been able to reduce the height of the calorimeter.

The gas was burnt at the rate of about 5 cubic feet per hour. The air supply was determined by the depth of the opening around the base of the instrument, and by the number and diameter of the holes provided at the top for the escape of the products of combustion. The dimensions of these openings had been so fixed that the flames burnt without smoking, even when the rate of consumption rose to 6 cubic feet per hour. In order to avoid over-heating of the inner chimney, he had put water to a depth of about an inch in the lower part of the container or outer vessel, and the lower coils of the circulating water-pipe passed through this water; so that the latter was kept cool by transference of heat to the circulating water. As, however, only the lower portion of the chimney was in contact with water, the upper part remained sufficiently hot to prevent any deposition of condensed water from the flames upon it. Heat radiated downwards from the luminous flames was, for the most part, returned to the calorimeter, either by the inflowing air or by reflection from the bright tinned upper surface of the base of the instrument. In order to preserve the thin wire of the coils from attack by the very dilute sulphuric acid resulting from the combustion of the sulphur in the gas, the coils were, when the instrument was not in use, kept immersed in water containing a crystal or two of carbonate of soda. They were lifted out bodily with the top of the instrument from the containing outer vessel, without removing the thermometers or water connections, and placed in a glass jar of the right size containing the alkaline solution. By this means the wire-wound coils were preserved bright and unattacked. In proof of this, he exhibited the coils of one of the calorimeters which had been in regular use in one of the London testing-places for nearly a year, and pointed out

*. See "JOURNAL," Vol. XCII., p. 808.

that they showed no sign whatever of attack or corrosion. The Junkers calorimeter, not having the fine wires and different metals in intimate contact, would not be so susceptible to injury from the feeble sulphuric acid; nevertheless he had been shown some of these calorimeters which in a short time had suffered greatly from corrosion. The calorimeter he had designed was not intended for the determination of the heat evolved to such a degree of exactness as might be required in purely scientific researches, but was intended to be as precise an apparatus as was consistent with practical requirements in respect of speed and convenience in working. It could no doubt be modified to give slightly greater precision, and the already quite trifling heat losses could be guarded against; but no appreciable gain would result to the calorific value attributed to the gas.

Measuring and Testing Producer Gas.

Following the exposition by Professor Boys of the calorimeter he invented, Professor Threlfall presented his paper. It was a voluminous one, in which were traced the results of five years' experience in measuring and testing producer gas. The period of experience was long, and the lines of research and decision varied; and therefore—the time at the disposal of the meeting compelling compression—the Professor scanned the contents of the paper, and illustrated his points extensively by drawings and diagrams on a lantern sheet. The method of description was interesting and most entertaining in places—for most of those present; but it does not give the writer of an account of the work who is denied access to manuscript and diagrams pending their publication in the Society's own "Journal" much scope for lucid explanation. Those interested in the subject will therefore have to look for the details in the Society's publication. In speaking of the measurement of gas, Professor Threlfall referred to large quantities—that is to say, millions of cubic feet an hour, and consequently many millions of cubic feet a day. In setting out upon this subject, it appeared that he did not do so with the object specially of measuring large quantities of gas, because, like other chemists, he considered that the ordinary method of measurement for considerable quantities was necessarily and fundamentally wrong. Originally he was particularly introduced to this work by having to test a large alternator. For that purpose, he had to measure a stream of air, and had his choice as to what velocity he should use. He was so successful in measuring the velocity of the air, and therefore the volume of air passing over the alternator per hour, that in this way he was able to obtain the efficiency of the alternator. When he first began to measure gas, he took the so-called Fletcher gauge, which was an apparatus that had long been used in chemical works; but with this he found certain objections for his particular purpose. He then took the Pitot tube; and with it he had been a great deal more successful. He showed on the screen the arrangement that he had used in practice; describing in detail by the aid of the picture the alterations he had made to meet the difficulties of tar, dust, and dirt for the measurement of the producer gas. He had tried to obtain reliable means of measuring small amounts of pressure; and he illustrated the instrument devised for the purpose. He confessed, however, that the Cambridge Scientific Instrument Company made a nicer instrument; and it gave the means by which, in one observation, the pressure could be determined equal to an accuracy of $\frac{1}{200}$ mm.

Attention was next devoted to the theory and practice of measuring pulsating streams of gas or air—such, for instance, as are produced by pumping by gas-engines or otherwise. Here there was introduced the Threlfall stream-gauge, by which the differences of pressure are transmitted to a bell, hung from springs. The measurement was obtained round a dial, having a range the full round of the scale. The smallest was up to 0·5 mm.; the second size, 0 to 2 mm.; and so on. But the 0 to 2 mm., it was stated, was the most useful scale for practical work. After the stream-gauge, the author made a gas-meter. In this a bell was hung from the arm of a balance; the other arm carrying a weight, which dipped into a vessel containing oil. The weight was so shaped that the angular motion of the beam was exactly according to the velocity. [Incidentally the author mentioned here that he used a Weldon Mud purifier to remove the sulphuretted hydrogen from the gas.] As the beam turned down, it allowed an integrating wheel, connecting with trains of wheels, to move across a glass disc, being driven by an eight-day clock. The objection had been raised to the fact that the whole of the moving parts of this meter were carried on rafts floating on oil. But the instrument, Professor Threlfall said, had worked beautifully; it had, in fact, done most satisfactory work for him for four years. It had never been touched or taken down—nothing whatever had been done to it but to wind the clock. The pressure at the point where the gas was measured was about 2 feet of water.

The author next gave a description of the means adopted for determining the density of the producer gas. Here, again, the author's description by illustration and curves defies any proper explanation of the apparatus used. But eventually, the issue of the whole work was presented. After four years' measurement of producer gas—from four producers, each using about a ton of fuel per hour, with a gas-meter at one end and stream-gauges at each point of delivery and use—the results of balancing the make and distribution (shown by curves) indicated that agreement to within about 2 per cent. could be attained in practice.

The methods hitherto proposed and practised for the determination of the volume of gas produced per ton of coal otherwise than by the author's meters, were also considered, and examples were given of the results of balancing on ammonia and carbon. In measuring gas by the ammonia-balance, the amount of ammonia in a cubic foot of gas was determined, the quantity of sulphate of ammonia made in a day, and the quantity of coal used in a day being known; and with these factors an idea could be formed of how many cubic feet of gas were produced per day. Professor Threlfall described the apparatus used in this form of determination. The one to which he referred passed many hundreds of cubic feet of gas per day, which was necessary to get a reasonably correct balance. But to show how close were the gas production quantities as determined by the ammonia test and by actual measurement, he gave the following relative figures: By the ammonia test 114, by meter 109; by the ammonia test 125, by meter 110; by the ammonia test 115, by meter 105. There was here something like a 10 per cent. error every day; but taken over a period, they came out very much the same. A most favourable way was to balance on carbon. Many years ago the author made an elaborate trial, and got a very good balance by this method and by meter, and was able to account for all the carbon. He did not think a balance on the carbonic acid gave very accurate results; for it was not easy to estimate with accuracy the carbonic acid.

Turning to producer gas temperatures, Professor Threlfall said there was nothing more important than a correct knowledge of the temperatures in producers—particularly those working with ammonia recovery. This had led him to adopt a system of thermocouples; and these were read by means of a potentiometer, suitably divided to read direct, and fed by a very large Clark or cadmium cell. Following on, the author spoke of the necessity of calorimeter tests, especially where one had to do with gas-engines, in view of the variations in the quality of the gas with variations of production by gas-producers. He referred to the instruments he had devised, and considered he might claim that he had attained reliability and durability. A continuously recording calorimeter which he had designed, but which was not described in the paper, he acknowledged had given him a great deal more trouble in its perfecting than any other he had had to do with.

On the subject of the testing of sulphur in producer gas, he described the Gas Referees' test. In producer gas, vastly greater quantities of sulphur than in ordinary gas had to be dealt with; and for this purpose the Referees' test was less suitable than a modification of Valentine's test. The discussion of this matter by the author covered both the determination of sulphuretted hydrogen and of total sulphur; and it was shown that it was fatal to the sulphuretted hydrogen to employ a gas-meter containing water—no matter how long it might have been in action. The next part of the paper dealt with testing producer gas for tar; and a proposal was made for a standard method of carrying out this investigation. In passing, the author mentioned that he found sawdust the best material for scrubbing producer gas; and the working of two purifiers in series the best system.

There was a brief discussion of the communications. In the early part Professor Boys stated that he had omitted to pay a tribute to Messrs. John Griffin and Sons, who made his calorimeter. The first instrument they produced for him, if not absolutely right, was at least exact with his drawings. With a very small alteration, the first instrument was in the form in which it was now exhibited. Other speakers made many complimentary remarks about both Professor Threlfall and Professor Boys. One inquirer sought to learn of Professor Boys whether the water in the bottom of his calorimeter, when the apparatus was working (say) with 10-minute estimations over a period of 24 hours, would not get hot, and thus cause heat loss. The same gentleman asked whether the instrument had been used for producer gas, how it compared with the older instruments if worked alongside them, and how it compared with calorific values worked out from a careful analysis of the gas. There was agreement on his part with Professor Threlfall's assertion that gas measurement by chemical means was totally unreliable. He had made estimations from ammonia in gas within 5 per cent. over considerable periods. But even that was not so reliable as measurement by meters. He believed the continuous calorimeter of Professor Threlfall would be of great use; and he agreed that a standard method of estimating tar was desirable. In some remarks by Dr. Harold G. Colman, he expressed disappointment that Professor Threlfall's paper did not contain an account of the continuously recording calorimeter. The testing of calorific values was a matter of considerable interest to those connected with gas supply in any form. As calorific power was getting of prime importance in gas supply, they wanted an instrument by which the manufacture could be controlled in regard to calorific power. He hoped before long there would be available an instrument suitable for the purpose. As to Professor Boys' paper, he (Dr. Colman) had made many hundreds of tests with the Jünkers calorimeter, and he had felt very keenly the nuisance when he was making a number of tests per day of having to run up and down steps to read the thermometers. To have three thermometers in positions where they could be read at once (as in Professor Boys' instrument) was a great advantage. The whole thing was get-at-able. Any part could be reached and renewed with ease. With the

Jünkers calorimeter, if anything went wrong, it had to go back to the makers, because the parts were soldered up, and one could not get to the inside. Respecting corrosion, he must say that, so far as the Jünkers instrument was concerned, he had not found any difficulty with it. He thought Professor Threlfall's paper would be of great interest even for those who were dealing with gas in what he supposed the author would call small amounts —say, 5 to 10 million cubic feet per day—where ordinary meters were sufficient to measure the gas. The instruments devised for measuring different streams of gas should be of immense value. They should also be most useful in water-gas manufacture. The amount of air that was blown into the generators made an enormous difference to the working. Under ordinary circumstances, the only measure they had of the amount of air that was passing through the fuel was the blast pressure—the actual static pressure of the blast. With an instrument such as the one just described, it would be possible to check the amount of air passing in; and for that purpose it would be very valuable.

In his reply, Professor Boys showed that the heating of the water at the base of his calorimeter was fully provided against; and the water never rose more than a degree or two above the atmospheric temperature. He had not used the instrument for testing producer gas. He had made some comparisons of the instrument with the Jünkers calorimeter. In that particular part of London, they were provided with a gas which, he believed, was striking. The calorific value constantly changed—sometimes spasmodically, but not as a rule very rapidly. He had a couple of instruments set up, and made alternate tests in the two for several weeks at odd times; and so far as the small variations of the calorific value which occurred would allow one to say, he could not say which was the higher. The two sets of values fitted in one with the other so well that he could not say, on the whole, which instrument gave the higher results. He had not used the new calorimeter for producer gas; but he thought there would be no great difficulty in applying it to such use. He had, with Mr. W. J. A. Butterfield's assistance, made tests with it with hydrogen burning at the rate of about 8 cubic feet per hour, and the results had appeared satisfactory; but the final gas-analysis to check the purity of the hydrogen used had unfortunately failed, and the test had not yet been repeated. He did not think an analysis of coal gas would be of much service in checking the accuracy of tests of that gas in the instrument. He was glad to hear Dr. Colman's remark about the absence of corrosion in the Jünkers calorimeter. He (Professor Boys) had happened to see the inside of one calorimeter, which was in a bad state; and he was horrified. The instrument on view (one of Professor Boys' own design) had been in use at one of the Metropolitan testing-stations for nearly a year; and it had simply been brushed out with a tooth-brush. The state of the instrument showed that corrosion to any practical extent had not occurred at all.

Professor Threlfall, in the course of his observations, remarked upon the gratification it was to him to have heard his work spoken of in the way it had been. It was a great encouragement.

SCOTTISH JUNIOR GAS ASSOCIATION.

Eastern District.

The members of the Eastern District Section of the Association attended in good numbers the quarterly meeting, which (as briefly mentioned last week) was held in the Heriot-Watt College, Edinburgh, on Saturday, the 2nd inst.

The PRESIDENT (Mr. W. Brown, of Lasswade), in opening the proceedings, said the members had arrived at their last quarterly meeting for the session. Looking back, he thought they had good reason to be proud of what they had done. The attendances had been encouraging; and he was sure no one would regret the time he had spent in connection with the Association.

GAS-GOVERNORS.

Mr. J. W. LILL (Edinburgh) read a paper on the above subject, illustrated by lantern slides.

At the outset, the author disclaimed all intention of presenting a paper upon any new invention, but would endeavour to give a description of a few of the governors used in regulating the pressure of gas in street mains. Before describing any particular type, he would consider a few points to be observed in the designs of these appliances; the chief being that all parts must work with the least amount of friction, and, as far as possible, the valves be in equilibrium at all parts of their travel. This was obtained by balancing the inlet pressure on the cone valve, which must be capable of adjusting itself to any variation of initial pressure due to the gasholder cupping or uncupping, or to being changed. It must be sensitive to any fluctuation in the consumption, and must automatically control the pressure predetermined by the manager. The advantages of a governor were many; for if the gas were stored in a holder and allowed to flow into the town main, the varying weights of the holder, by its partial immersion in water, and a consequent difference between the weight and specific gravity of iron of which it was composed, caused a considerable difference in pressure. Again, if they bore in mind the loss in the mains, there was a considerable advantage in reducing the pressure to a minimum, because whenever the pressure in the main exceeded that which was necessary, there was a loss to the supplier through increased leakage.

Mr. Lill then showed a sectional view of an old Milne governor wherein the gas, upon entering, passed round the cone valve, and away by the outlet; the weight of the valve and bell being counterbalanced by an air-pipe float fixed around the bottom of the bell. He explained that one special feature about the cone valve as now constructed was its parabolic shape, which was the result of careful calculation; the object to be attained being equal reduction of area during the entire travel of the valve. Formerly the cones were made straight. He next showed a diagram of a cone valve, 18 inches long and 12 inches in diameter, divided into twelve equal parts, the area being given for every 1½ inches of travel; and he pointed out that they had a reduction of area of 9·425 square inches.

The author reminded his audience that gas pressure is always spoken of in so many tenths of an inch, or, for high pressure, in inches, and the weight of water is such that a column 27·63 inches high is equal to 1 lb. per square inch. He stated that to find the weight required for any governor—say, for instance, one of about 20 inches diameter, the area of which was 314·16—divide by 27·63, and the answer will give 11·04; so that a weight of 11·04 lbs. gave 1 inch pressure. Any other weight could be arrived at by direct proportion. Reverting to the governor just described, he said one objection to it was that any sudden increase of pressure on the inlet made it oscillate, causing varying pressure on the outlet. To obviate this, several methods had been adopted. He showed one with the bell made in two compartments, the centre or smaller bell being equal to the area of the base of the cone valve, the inlet gas having the same area to pass in opposite directions, keeping the whole in perfect equilibrium. The outer compartment, having a connection to the outlet chamber by means of a small wrought-iron tube, allowed the bell to rise and fall, and with it the cone valve, as the consumption on the outlet varied. The bell was guided by means of two vertical columns, extended from the cast-iron tank upon which a bridge-piece was placed, a hole being bored in the centre to guide a rod rising from the top of the bell, and small pulleys being fixed on the bottom which engaged against the sides of the tank, thereby keeping the moving parts in a vertical line.

Mr. Lill next showed a type of governor arranged somewhat differently. It was known as Milne's compensating governor, being made up in two separate cast-iron tanks—one for the bell and the other containing the cone valve. He said the chief feature of this design was the easy access to the working parts, for periodical examination. The valve could be taken out without disturbing the bell. He then showed a Peebles governor, and said it was simple and of a compact nature, the ordinary cone valve being departed from. The valve-seat was a cylinder open at both ends, and around its circumference a series of small, and more or less conical, openings were formed. The valve was pyramidal in form, suspended by a rod from the roof of the bell. Messrs. Parkinson made a similar two-coned governor.

All the governors so far described had their pressures adjusted by weights. The author next showed a type known as Cowan's water-loading governor, in which they had still another valve arrangement, known as Key's patent valve, of cylindrical shape, closed in the bottom, and having a series of slots cut around its circumference, the gas passing through them. To load the bell, they opened the quadrant cock and allowed water to flow into the top chamber. This, in turn, overflowed the seal, and ran into the loading-tank. To lower the pressures, they opened a cock which allowed the syphon to draw the water off. This, in turn, had to be shut off when the minimum pressure had been reached. A governor, the invention of the late Mr. Foulis, which had of late sprung into great popularity among gas managers, was next shown. It differed very considerably from any described, inasmuch as the bell itself formed the cone or valve, and two cones were provided, so as to balance the effect of the inlet pressure. The whole being contained in a cast-iron case, the usual method of placing weights could not be adopted. A second bell was therefore provided, and was connected to the under side of the coned bell by means of a wrought-iron or lead tube, so that the pressure on the under side of the governor bell and that on the air bell were the same. Consequently, any loading placed on the bell, causing increased pressure upon it, was at once communicated through the tube to the other bell. This pressure was used to counteract the pressure upon the upper side of the coned bell, and thus any desired outlet pressure could be secured. But, further, to keep the coned bell from responding too rapidly to the pressure on the upper side, a plunger was connected to it in such a way that a liquid (usually glycerine) had to pass from the inside of the cylinder to the outside, or through a very small hole provided in the upper end of the cylinder. Another good feature was that, the whole governor being buoyed up by air, the coned part of the bell alone was subject to gas. The air or regulating bell could be placed in any convenient situation, and should the bell become damaged or the water-seal be blown away by excess of pressure, no escape of gas would ensue. Should the communicating-pipe between the two bells be broken, a very good arrangement had been designed to prevent the closing of the valve by the introduction of the air-tight float, placed around the bottom of the coned bell, set to the minimum pressure required, so that should the pipe be cut, the pressure would only drop to the minimum, and lights in the town would not be extinguished. This feature alone practically made the governor "foolproof."

In conclusion, the author said all the governors were dependent, more or less, for water to seal their working parts, and in winter, when the thermometer was often at or below freezing point, it was best to take some precaution to prevent the water from becoming ice. He showed a diagram worked from a table given by Messrs. Veitch and Wilson, and explained that if 10 per cent. of glycerine were mixed with water, it would freeze at 30° Fahr., and 20 per cent. at 27½° Fahr.; so that if they used 20 per cent. of glycerine with the water in the bell, the danger of freezing would be averted. The last governor shown was one used in high-pressure mains. It was of the Foulis type without the plunger; the seal for the coned bell being mercury.

SOME NOTES ON ELEVATORS AND CONVEYORS.

Mr. W. B. Leech, A.M.I.Mech.E. (Edinburgh), read a paper on the above subject, in the course of which he said:

I will deal with coal and coke elevators, and push-plate, steel belt, gravity bucket, and hot-coke conveyors. There are, of course, many other types suitable for handling gas-works materials; and it must not be thought, because I do not describe them, that they are of less importance. I do not touch the actual question of the cost of upkeep; but I give as far as possible my experience in reducing the wear and tear of this class of machinery.

It is very generally recognized that cased-in elevators are the most suitable for handling gas-works materials. With the lattice-braced elevator, there is more or less a constant spill from the buckets during the journey to the head. This, besides being dangerous to those at work or passing near, gives the surroundings an untidy appearance, and I have always found it extremely difficult under such circumstances to get the men to keep the plant in good order. Cased-in elevators, however, have disadvantages of their own—the chief being the difficulty of getting access to the moving parts, either for inspection or for repairs. This has been entirely overcome at Granton by a combination of the lattice-braced and cased-in types. The elevator shown in fig. 1 is used for lifting coal from the crusher-pit to the bunkers

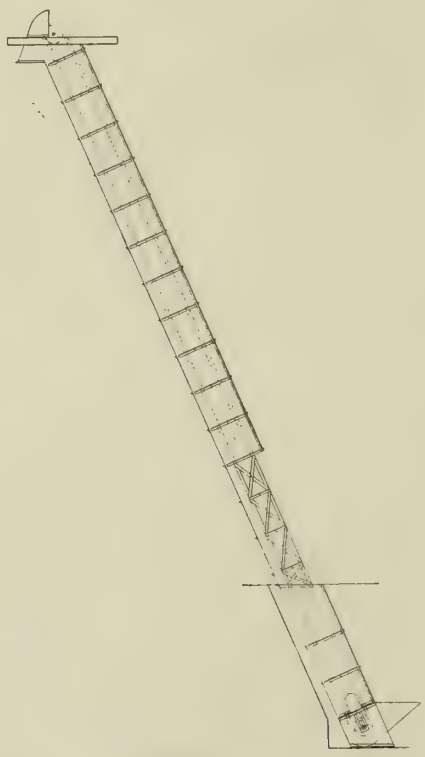


Fig. 1.—Lattice-Braced and Cased-In Elevator.

above the retort-benches. It will be noticed that from the ground level the frame is lattice-braced for a distance of about 18 feet up, the remainder being cased. This design has all the advantages of lattice-braced and cased-in elevators, with few of their disadvantages—that is to say, there is an easy access to all working parts, and a freedom from the continual spill of the material being handled. For twin elevators this design is of greater service, as it is very often necessary to overhaul one side while the other is running. I have found this to be practically impossible where the frame is lattice-braced. I have in mind an instance where two lattice-braced coal elevators were arranged side by side, and in this case it was quite impossible to overhaul either when the other was working; while if one were allowed to stand for two or three days, the boot and the buckets were filled with fine coal to such an extent that it was impossible to start the elevator until the coal in the boot had been removed by hand. Often the coal had also to be removed from the buckets before a start could be made. In the elevator boot there should be, in addition to the usual cleaning-out door below the bottom shaft, a door of sufficient size to allow for the removal of the trailing sprocket-wheels without taking down the feeding-shoot. Much trouble is caused by putting these wheels in the wrong way, it being often forgotten that the trailing wheels are the driven, and not the drivers. I have found, however, that, where the pattern of chain will permit, it is far better to discard sprockets and substitute in their place guides fixed to the sides of the wheels.

To the back of each bucket is attached a skidder-bar, the ends of which rest in the angle runners of the elevator frame, for the purpose of guiding the buckets in a direct line throughout the length of their travel. As will be expected, there is a great amount of wear on both the bar and the guides—so much so that it has been found necessary to line the latter with wearing strips to prevent the frame being permanently damaged. For elevators handling non-gritty material, these strips are generally made of hard wood. Care, however, must be taken that there are no square edges on the parts of the skidder-bars coming in contact with the wearing strips. I think hard-wood liners are more suitable for lattice-braced elevators; and even then they are not entirely satisfactory, as there is always the danger of their being torn up. Once let the skidder-bar grip, and you may safely count upon having to renew the whole length of the liner on that particular side. At Granton, the best results have been obtained from a special hard mixture cast-iron liner of about 2¼ in. by 1 in. cross section. These will be found, besides being very serviceable, remarkably cheap; and they are better when the iron is of that hard, brittle nature which iron-founders are often wont to supply, even when they are not asked to do so. These liners are cast in 5-feet lengths; the ends being bevelled in such a manner as to give the skidder a lead from one to another. They are attached to the angle runners by ½-inch taper bolts 2 feet pitch, and are mounted in their rough state. The ends of the skidders are protected by a cast-steel cap, as shown in fig. 2.

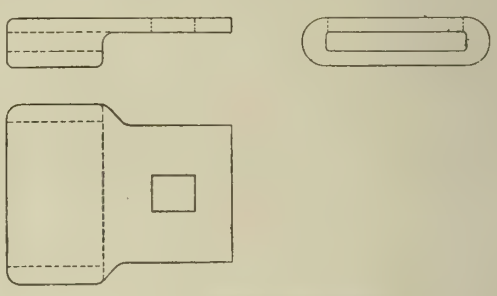


Fig. 2.—Skidder End Caps.

Referring to push-plate conveyors, I should like to mention the fact that, even after taking into consideration the difference of the angle, the wear and tear on the guides is much greater than on elevator guides. Taking the elevator, it will be readily understood that the weight of the bucket has a tendency to lift the nose or forward edge of the skidder-bar from the guides. (This happens on both forward and return chains.) There is no doubt that the layer of coal dust formed on the guides is greatly due to this fact. With push-plate conveyors, the weight of the load against the plate has the opposite effect, and tends to dig the nose of the skidder into the guides, causing it to act more as a scraper than a skidder. It is solely on this account that hard-wood liners are so unsuitable for push-plate conveyors. Take, for instance, a mild steel skidder-bar which is not protected by a cap. The section is (say) 3½ in. by ⅜ in. After a few months' run, the nose is worn away to a razor-like edge; and one can easily imagine what would happen to the hard-wood liners should by any means the push-plate be further tilted. Even with cast-iron liners, the skidder-bar cap should be from 1 to 1¼ inches thick, and the edges rounded off to the greatest radius. The push-plate conveyor referred to was mounted with cast-steel caps; but with a duplicate conveyor it has been found necessary to renew each year not only the cast-steel caps, but the cast-iron liners where the cross section of the former was only 3 in. by ½ in.

Returning to elevators, the method of attaching buckets to the chain is another point which has given much trouble, chiefly through the bolts working loose. To overcome this difficulty, many engineers use a bolt of sufficient length to allow several threads to project past the nut. After the nut is tightened, these threads are burred up. This, of course, prevents the nuts from slacking off; but should it be necessary at any time to remove the buckets, all bolts so treated would have to be cut out before this could be done. Other methods, perhaps slightly more expensive in the first place, are to use bolts provided with lock-nuts or drilled for split pins. A bolt with a very fine thread has been found to answer the purpose very satisfactorily. Cup-headed bolts with round necks are generally employed; but it would be better if the holes in the buckets were punched to suit square-necked bolts. A built-up mild-steel bucket is the best for handling coal; but for coke, ash, and similar materials, I think a stamped steel bucket would be found more serviceable, except, of course, in the case of continuous bucket elevators.

There are many good types of elevator chain; and I think the one most suitable for coal elevators is the roller. With this type of chain it is possible to use the ordinary sprocket-wheel in place of the hexagonal driving drum, which is objectionable in elevators, on account of the unsteady movement it imparts to the chain and buckets. The roller chain is made up of plain and attachment links, both of mild steel, connected together by a turned bolt, the nut of which is made secure by a split pin in the bolt. Between

the two plain links a mild steel roller is mounted, and this greatly reduces the friction when engaging with the sprockets of the driving and trailing wheels. The pitch of this style of link is usually about 9 inches. Riveted chains should certainly be avoided, as they are not safe. The riveted ends of the pins are very liable to break; and it is a most difficult chain to remove or repair. Elevators with buckets more than 15 inches wide are provided with two strands of chain. The pitch of the buckets is usually about 18 inches. The speed of the chain varies with the size of the elevator and the materials handled. A 30-inch coal-elevator should be set about 100 feet per minute; but a 12-inch elevator for oxide may be run as fast as 400 feet per minute. These speeds, I should say, are the extremes. Elevators may be set practically at any angle, from 35 to 90 degrees, provided that a suitable bucket is used. Below 35 degrees I think a steel-belt conveyor, with angle cross-bars, is more suitable.

Where duplicate plant is necessary as a safeguard against a complete stoppage through a breakdown or some other cause, the elevator frames are very often combined, and made to form what is known as a twin elevator. The reason for this is not one of economy, as it would at first seem; but, on account of the common inlet and outlet, it is necessary that the elevators should be as close to each other as possible. A deviation may be made from the general design of frame, which protects it from any wear and tear whatever, and makes it, one might almost say, everlasting. On account of the side play of the chain, the ends of the skidder-bars in time wear away the upturned flange of the angle runners.

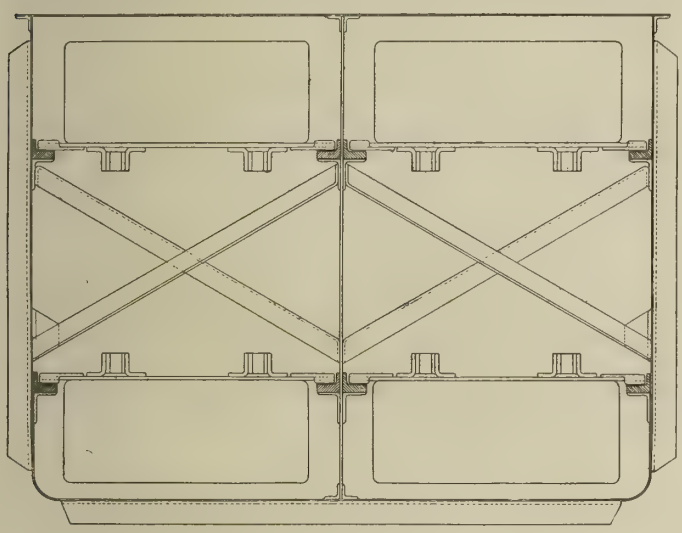


Fig. 3.—Inverted Angle Runners with Cast-Iron Liners.

With single elevators, these are not very difficult to renew; but in twin elevators the angle runners attached to either side of the division-plate are perforce riveted in such a manner that it is impossible to remove one without the other—thus necessitating the entire stoppage of both sides when renewals are to be made. This difficulty has been overcome by inverting the angle runners, and attaching to them cast-iron liners in the manner shown in fig. 3. The driving and trailing gear of twin elevators is arranged in such a manner that one side may be easily removed for repairs without interference with the other.

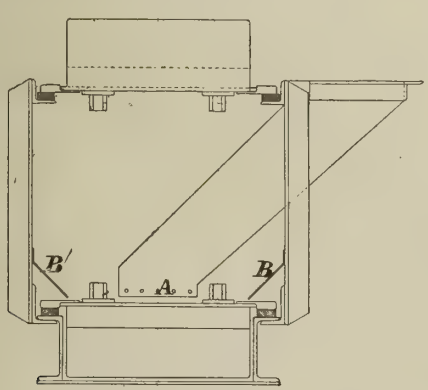


Fig. 4.—Push-Plate Coal Conveyor.

I think the most common type of coal-conveyor to be found in gas-works is what is known as the "push-plate" conveyor, a section of which is shown in fig. 4. This type is, without doubt, the simplest and one of the most efficient conveyors for handling coal. It requires practically no attention beyond the manipulation of the outlet-doors, which may be arranged at any suitable point and interval along the trough. It may be driven from either the inlet or the delivery end, and it is possible to set the outlet-doors in such a manner that the load will be divided and discharged at several points at the same time. The design of the feeding-shoot is a point of greater importance than it seems. The general idea, I think, is that this should be as wide as possible at the lower end, so as to ensure the coal being spread evenly across the full width of the trough. I have, however, found that for conveyors having two strands of chain, the shoot is sufficiently wide when made to deliver in between the strands. This prevents the coal from falling on to the chain and being carried to the far end of the conveyor, where it is crushed to powder by the end drums. By attaching a strip of leather at the point A, the skidder-bars can be kept perfectly clean. The guard-plates extend about 3 feet either way from the shoot, their purpose being to prevent the coal from splashing on to the cast-iron liners. The conveyor frame at this point is plated. By adopting this arrangement, the conveyor will work better and cleaner, and there will be less friction on the guides. As in the case of elevators, push-plate conveyors with troughs more than 15 inches wide are fitted with two strands of chain. The driving and trailing drums for this chain are hexagonal. The average speed of the chain is about 120 feet per minute.

The steel-belt conveyor is suitable for handling almost any kind of gas-works material. It belongs to what is known as the "carrier" type; the load being carried on a belt made up of a series of mild-steel bent or joggled plates, attached to the driving-chains in such a manner that each plate overlaps the preceding by 1 inch or 1½ inches. When dealing with ashes and clinker, the load should be delivered over the end of the conveyor; but coal and coke may be discharged at any point. This is generally done by V-shaped ploughs, which divert the load into shoots on either side of the conveyor. Stationary ploughs may be fixed at convenient points along the conveyor; but a better way is to mount the plough on a travelling bogie, which may be set to discharge the load where desired. To obtain a satisfactory delivery, the plough sides should be fixed at an angle of 20 degrees or thereabout to the line of travel. When set at too great an angle, they are always a fruitful source of trouble. When the load is delivered over the end of the conveyor, the top angle runners of the frame are upturned, and so form a guide for the belt; but when the conveyor is discharged by ploughs, the top runners are inverted, and guide-rollers fixed at intervals of 10 to 15 feet. The chain for this conveyor is generally of malleable cast iron or cast steel, and is run at a speed of 70 to 100 feet per minute.

The gravity bucket conveyor, in spite of its heavy initial cost, is gaining favour with many engineers. It is at present, however, rarely to be seen in gas-works. For the purpose of emptying the buckets, sets of tipping gear are fixed where necessary. These formerly consisted of two small rollers mounted on movable arms, which, when brought into position, engaged with cast-iron cams attached to either side of the buckets. This arrangement was objectionable, as the cams were released when the buckets were at right angles to their normal position; and so heavily did they fall back, that it would be some considerable time before they came to rest. Of course, with lipped buckets this system was impossible. One can readily imagine the continual clatter caused by these buckets falling back into position. It was not until after many failures that a satisfactory arrangement was found. It is shown in fig. 5. A triangular-shaped

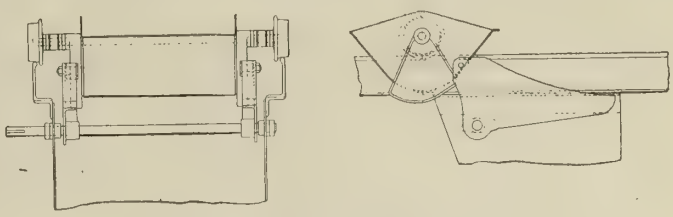


Fig. 5.—Gravity Bucket Conveyor.

guide-plate, provided with a roller for engaging with the cams, is mounted in such a manner that it can be put in or out of gear when desired. The cam, after leaving the roller, is steadied by the guide-plate until the bucket reaches its horizontal position. The lower portion of the cam was formerly similar in shape on both sides of its vertical centre line; but with these cams the guides were practically useless, no matter what their form might be, as after the buckets had once reached an angle of about 50 degrees they fell back to the horizontal with as much force as though there were no guides at all. The lower portion of the cam was then made eccentric in shape, with the greater radius towards the back of the bucket. This so steadied the buckets that they found their normal position, with their lips correctly set, without any noise whatever.

Of all materials, hot coke is the most difficult to deal with mechanically, as a conveyor for this purpose is exposed to the action of both fire and water. I think the chain suffers most at the point where the hot coke is quenched. The heavy rush of steam and water thrown up by it carries a large amount of dust into the working parts, no matter how well they may be protected. The wear and tear is consequently much greater than is the case with other conveyors; and on this account many engineers still prefer to wheel out their coke. I think, however, that this is a mistake, as the difference in the cost per ton of the two methods is sufficient to leave a handsome margin after the cost of upkeep and interest on capital have been paid.

There are many different designs of both the carrier and the drag-link type. In my opinion, the best of the carrier class is the grid conveyor, which consists of a belt of cast-steel or cast-iron perforated plates, mounted on flanged rollers, and running

in a mild-steel trough, so designed that the wearing parts are protected as much as possible. The coke is quenched as it is being carried to the delivery end; the waste water and coke dust fall through the perforations into the lower portions of the trough, and are taken by a push-plate, attached to the under side of the chain, to a point near the delivery end, where they are run off into a settling-tank. This conveyor requires very little power to drive it, and it does not break or over-quench the coke. Drag-like conveyors have a reputation for breaking coke; but I do not think they are quite so bad as they are made out to be. Provided with a suitable trough and chain, the coke should reach the delivery end in much the same condition as it entered the conveyor. Of this type, the now well-known De Brouwer hot-coke conveyor is the most common; but this has the disadvantage of having its chain covered by the load when at work, and consequently the wear and tear is somewhat heavy. A new type of hot-coke conveyor, designed by Mr. W. R. Herring, of Edinburgh, is giving excellent results. It is similar in action to the push-plate. The chain and the flanged rollers carrying it are arranged above the load, and are so protected by guard-plates that it is impossible for the coke to get anywhere near them. The rollers and pins are provided with renewable parts of chilled cast iron.*

One of the peculiarities of hot-coke conveyors is the expansion of the chain caused by the heat transmitted to it by the hot coke. Where no special arrangements are made to counterbalance this, after a few minutes' working under load the chain becomes so slack that it often jumps the sprockets of the driving-wheels. This calls to mind an incident which occurred at a Continental gas-works some years ago. A hot-coke conveyor, which had given every satisfaction during the first few days' run, commenced to slip the sprockets. The attendant rushed to the trailing end and tightened up the chain until the slipping ceased. Most likely he was pleased that he had been able to remedy the defect so easily; but he was very much puzzled when, an hour or so later, he discovered that the trailing end structure had been torn up from the foundations, and the driving end very badly damaged. This was caused by the contraction of the chain when cooling down. The expansion of the chain may be counteracted by having the trailing drums mounted on sliding blocks, provided with strong springs or weights to take up the slack. The simplest way, however, is to leave a gap, from 15 to 20 feet wide, in the return-chain guides, as near as possible to the driving-drums. The weight of the unsupported chain automatically takes up the slack.

Discussion.

The PRESIDENT asked Mr. Lill what the cost of 20 per cent. glycerine would be, and how long it would last.

Mr. J. MUNRO (Edinburgh), referring to the governor, mentioned by Mr. Lill, in which the pressure might go away without the lights extinguishing, asked, if the governor were in an isolated district, would there be no danger of the governor passing back to the inlet pressure?

Mr. SIMPSON (Dunfermline) asked if there ever was trouble with the air-chambers.

Mr. LILL replied that he would not think of using pure glycerine. There was a coarse, cheap kind, which was utilized by motorists in their cooling chambers. It would last for years. A float fixed in the bottom of an air-bell acted in the same way as a weight. If they had it fixed at (say) a minimum pressure of 15-10ths, they loaded the float at this, and let the pressure go above it. The moment they went beyond 18-10ths, back-pressure on the outlet-main forced down the governor. Parabolic valve governors had no air-chambers; they all worked with gas.

The PRESIDENT said the subject of governors was one which appealed to all who had anything to do with gas. In Lasswade they had one of the oldest governors; it was by Messrs. James Milne and Son. But he thought the day was not very far distant when they would have no need for these appliances. With gas fires, engines, and cookers in use during the day, and with lighting by night, they required all the pressure they could get. In one part of his district, he had had no governor in use for more than a year, and he had not found any disadvantage; nor did he think it had had any effect upon the leakage. They would soon need to be considering the advisability of supplying gas at a higher pressure than that which they had so far been in the habit of employing.

Mr. LILL asked Mr. Leech if he had ever used a slip-in link. He said he had never seen such a link used in coal or coke conveyors, but in those employed for other materials. These links were very handy in mending chains, as they saved bolts and wear and tear.

The PRESIDENT expressed a desire to know what would be the saving in cost, in using a hot-coke conveyor, as compared with a man wheeling away the coke, or other means of conveyance.

Mr. J. DICKSON (Kelty) asked what the percentage of breeze was in coke handled by conveyors, and before these were used. He said he could very well fancy that the crushing and the treatment the coke would get in a conveyor would be different from what it would be where it was tipped into bogies and landed in a bing, and so got very little handling. He did not think this method was so hard on the coke as the conveyor.

Mr. D. BISSET (Edinburgh) asked what would be the minimum size of a gas-works which could adopt elevators and conveyors. Could Mr. Leech give them any idea of the length of life of a conveyor lined with mild steel, compared with a cast-iron one. In the case of mild steel, he considered that the action of the heat and water would be stronger than with cast iron.

Mr. LEECH thought the link to which Mr. Lill had referred was made of malleable iron. It was used chiefly for outside work, for gearing, and not so much for elevators. It made a very good chain indeed. The cost of handling coke depended greatly on circumstances. At Granton, or in any works in which there was a large quantity of coke to be handled, the conditions were, of course, different from those in small works. He did not think breeze was made entirely by the conveyor, though it might be responsible to some extent. A general mistake was in the shoots, which were made sometimes to give the coke a drop which it could not stand when it was hot. Again, there were sometimes projections by which a great amount of dust was created. As to the size of works suitable for conveying plant, he had seen, at Lyons, six beds of horizontal retorts, he thought of sevens, and they had a coal and hot-coke conveyor. The retorts were fed by a charger. The whole of the coal was lifted by an elevator, and delivered on to the top chain—a very light pattern one—of a hot-coke conveyor; and the return chain took away the coke. The cost of such a conveyor would be very small; he should say not more than £500, or thereabout. Of course, the coke was not stored in a large heap, or screened. As regarded the lining of hot-coke conveyors, he intended to say that they were better with a mild steel trough, on account of the amount of expansion and the continual movement of the retort-bench. Wrought-iron troughs were very serviceable, but would not stand the wear and tear with coke; and therefore they must be lined with cast-iron wearing-plates. After some wearing, these became burnished, and the coke slid along them as it would upon glass. In a large place, they could not store coke by tipping it from bogies. He had seen abroad coke being taken out by men in buckets. At Granton this would cost them 10d. or 1s. per ton. In small works it might be done for 6d. per ton; but in large works a hot-coke conveyor, with screening plant, would take coke from the retorts and deliver it into the waggons, without being touched or handled in any way, at a cost of from ½d. to 1½d. per ton. There was a great deal of wear and tear in any hot-coke conveyor; but they could be relied upon now more than they could in former days. He knew of chains having been in use for about five years—of course, with parts renewed. One had been working at Granton for about eighteen months, and showed no signs of giving way.

On the motion of the PRESIDENT, the authors of the papers were thanked for their contributions.

* An illustrated description of the arrangement referred to appears on p. 681

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

There was a large attendance of members of the Western District Section of the Association at their meeting last Saturday evening, which was held in the Glasgow and West of Scotland Technical College, Glasgow, under the presidency of Mr. James M'Leod. The President opened the proceedings by intimating that it had been arranged to have a special visit to the Provan Gas-Works, to close the session, on Saturday, the 6th of April; the works having been kindly thrown open to the members by the Corporation. After the inspection, there would be a social gathering. They were on the look-out for papers for next session, and already they had promises of two, which he considered was a good beginning. He then called upon Professor Thomas Gray, D.Sc., of the College, to give a lecture on "Flame Temperature." We are, however, unable to give it in the present issue of the "JOURNAL," as Dr. Gray is desirous of preparing a summary of it for publication, which he had been unable to do before the meeting. We can nevertheless give an indication of its scope. The lecturer said that, in addressing himself to a subject which had already been so ably covered by Professors Smithells and Lewes, he was afraid that he could say little that was new. He submitted and explained a series of tables giving the molecular and calorific value of hydrogen, methane, ethylene, benzene, and carbon monoxide, went on to deal with their specific heats, and then took up the subject of the flame temperature of coal gas burning in air, which he said was a good deal more complicated. He showed, again by tables, the oxygen required to burn the various gases composing coal gas, the thermal capacities on combustion, at various temperatures, and illustrated by experiment the method of measuring the temperatures of gas-flames by means of the galvanometer and platinum wire arrangement. He dwelt upon the deteriorating effect which an excess of air has upon the temperature of flame—emphasizing the point that the same coal gas, consumed with different burners and with varying air supplies, gives different temperatures, and that it is necessary, in order to have complete combustion and the highest possible temperature, to have an exact proportion of gas and air, and to have them properly mixed. The maximum temperature attained from coal gas, he concluded, was about 1780° C. As Dr. Gray had intimated his willingness to reply to questions on the subject he had dealt with, several were put to him and answered; and he was cordially thanked for his interesting lecture, the summary of which will be given in a subsequent number.

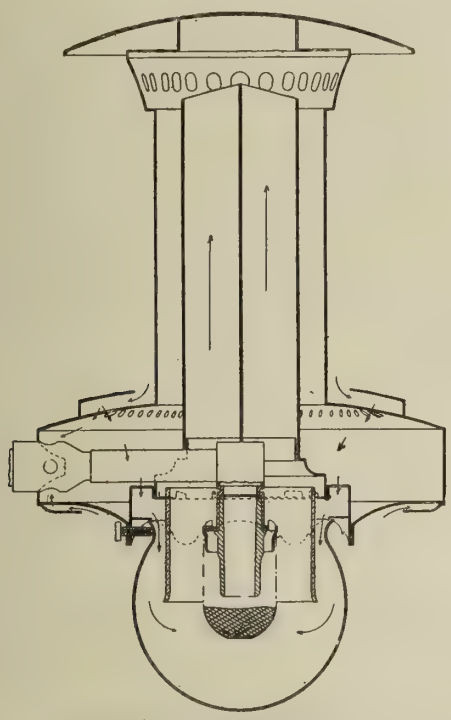
REGISTER OF PATENTS.

Lamps with Inverted Incandescent Burners.

GRAETZ, M., of Berlin.

No. 3759; Feb. 15, 1906.

This is another form of the Graetzin gas-lamp; the patentee's object being "to efficiently protect the burners from atmospheric air draughts and to arrange the bunsen burner of the lamps in such a manner that the air supply is steady and unaffected by atmospheric air draughts, thereby providing a steadier light than hitherto and prolonging the life of the mantle."



Another Form of the Graetzin Lamp.

The mantle is surrounded by a transparent tube or cylinder, which is, by its upper end, connected to a tube divided in two parts by a partition-wall. The cylinder is surrounded by a closed globe carried by the lamp casing; the joint between them being airtight. The currents of air are thus drawn in as indicated by the arrows.

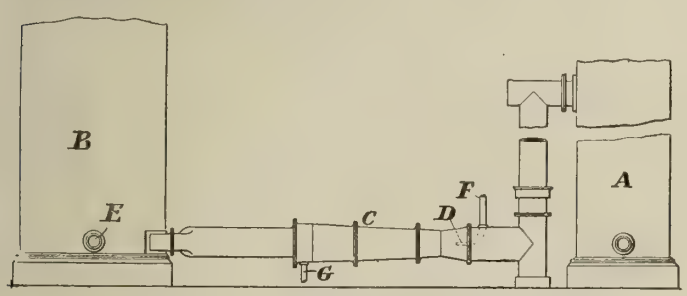
The primary air for the burner is protected against the currents of atmospheric air by the casing, which also shields the currents of secondary air, which also move in the direction of the arrows to the mantle. The combustion gases enter into the upper space of the casing, and thereby maintain a continuous current of air in an upward direction, and so influence the current of atmospheric air that "a very uniform burning of the bunsen flame in the globe is obtained."

Withdrawing Gases from Retorts, &c.

BIEMANN, W., of Bishop Auckland.

No. 4001; Feb. 17, 1906.

This invention for withdrawing gases from gas-retorts or coke-ovens consists in the combination of a water-injector introduced into the gas-main between the condenser and the scrubber and a pump, which continuously circulates ammoniacal liquor through the injector. The injector thus forms a substitute for the exhauster generally used.



Biemann's Plant for Withdrawing Gas from Retorts.

The invention represents a gas-main leading from a condenser A to a scrubber B. The portion of the main marked C is constructed like the outer tube of a water-injector, and in it is fixed a nozzle D for delivering water in the form of spray. The ammoniacal liquor from the scrubber drains by the pipe E into a tank, from which (at the start) some of it is supplied under pressure by a pump to be fed to the injection-nozzle D through the pipe F. The ammoniacal liquor thus spraying into the main, drains away by the pipe G to a tank, in a more concentrated condition than when it left the scrubber. It is then supplied to the pump instead of the liquor from the scrubber, and is again passed through the injector-nozzle, and so on, until it is no longer capable of exerting useful scrubbing action.

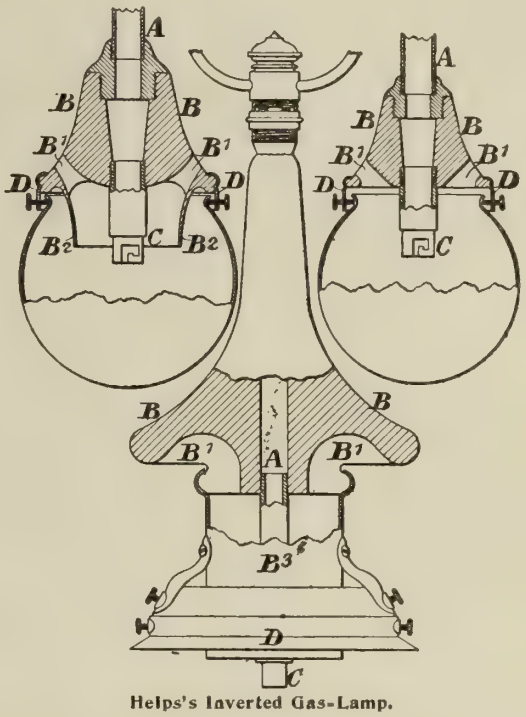
An injector used in this manner, the patentee remarks, not only scrubs the ammonia from the gas, but extracts the tar.

Inverted Gas-Lamps.

HELPS, GEORGE, of Nuneaton.

No. 10,621; May 7, 1906.

The patentee proposes, in an incandescent gas-burner, the combination with a heat-diffuser (of china or other refractory material) and globe-carrier, secured to the gas-pipe, and forming a continuation of it, of passages formed in the body of the diffuser for carrying away the products of combustion, and a burner-nozzle secured to the heat-diffuser.



Helps's Inverted Gas-Lamp.

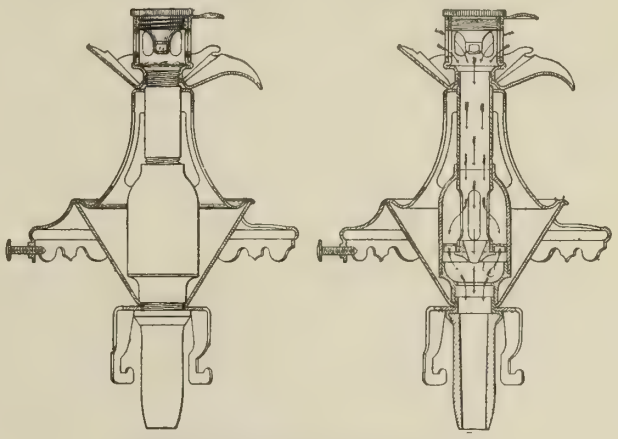
The illustrations show a section of a heat-diffuser and globe-carrier suitable for use with a globe in which no air holes are provided in the globe; a heat-diffuser and globe-carrier suitable for use with a globe provided with holes for the inlet of air; and a section of an arrangement similar to the first one, but in which the portion carrying the globe is not made in one piece with the heat-diffuser, but is merely attached to it.

Inverted Incandescent Gas-Burners.

WRIGHT, J. W. B., and DARWIN, H., of Birmingham.

No. 12,644; May 31, 1906.

This invention has for its object to provide an improved construction of inverted burner whereby the mixture of gas and air is thoroughly incorporated, and is, by virtue of the injector-like action of the device, supplied to the point of ignition under increased pressure.



Wright and Darwin's Inverted Burner.

As shown, the burner is provided with two superimposed mixing-chambers, the upper of which is in communication with the gas-and-air supply fitting, while the other communicates directly with the outlet leading to the ignition-tube of the burner. The mixture produced within these chambers is delivered under pressure to the ignition-tube by the injector-like action set up by a jet of mixture projected at a comparatively high velocity from a nozzle at the lower end of the central supply or induction tube and passed through the lower mixing-chamber to the ignition-tube. It carries with it the mixture from the chamber, and thereby delivers it under pressure to the point of ignition.

The central supply or induction tube (which depends from the ordinary regulator fitting, and whereby the gas and a regulated amount of air are admitted into the burner) has attached to it a continuation or extension sleeve formed with a series of vertical slots or openings, whereby the tube is placed in free communication with the upper mixing-chamber and terminates in an injector-nozzle or throttled outlet, whose restricted passage is presented to the mouth of the ignition-tube

so that the stream or jet of mixture issuing from it is projected directly into the ignition-tube. This upper mixing-chamber may be formed by a domed or inverted cup-like attachment secured to, and suspended from, the central supply tube at about its junction with the slotted extension sleeve; and the attachment carries in its turn a cup-like or dished element, which surrounds the injector-nozzle of the central sleeve and constitutes the secondary mixing-chamber. The secondary mixing-chamber is partitioned off from the top chamber by a grid-like or perforated plate or diaphragm whereby the mixture drawn from the one chamber to the other is "thoroughly pulverized and incorporated" before being carried by the injector jet from the central nozzle into the ignition-tube suspended from the bottom of the secondary chamber in such a position that its upper end comes in a lower plane than, but concentric with, the injector-nozzle.

With such an arrangement, the initial mixture supplied to the upper mixing-chamber through the slots or openings in the extension of the central induction tube, and the "pulverized and intimately incorporated" mixture in the lower chamber, are always subjected to the pull or suction of the injector jet from the nozzle which lies within the middle of the lower chamber; and thus the completed mixture is delivered to the ignition-tube at a high velocity and at an enhanced pressure, which is said to ensure "a maximum of illuminating efficiency being obtained with a minimum quantity of gas when the mixture is burnt in contact with an incandescent mantle."

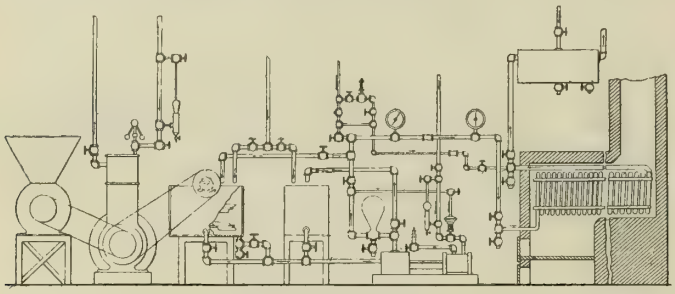
Manufacturing Gas.

COHEN, P. I., of New York.

No. 16,600; July 23, 1906.

This invention relates to the manufacture of illuminating and heating gas from hydrocarbon oil, or an emulsion of oil and water, or a semi-liquid emulsion containing oil, peat, and water, or other suitable ingredients.

The object of the invention is to provide for rapidly and economically generating high candle power gas—40 to 60 candle power—at a single operation, by forcing hydrocarbon oil under a constantly maintained and automatically controlled pressure through coils of pipe, heated to a temperature at, or above, the degree at which gasification is effected, or to make gas of lower candle-power for heating purposes and motive power in gas-engines by forcing a mixture of oil and water, or oil, water, and ground peat under like conditions through heated coils.



Cohen's Oil-Gas Plant.

Another object of the invention is to provide an apparatus which is "simple" in construction and operation, and which is adapted for rapidly and economically generating gas, at a single operation, by forcing such liquid or semi-liquid, under a maintained and automatically controlled pressure, through heated coils or conduits, kept at the proper temperature for making fixed gas.

A special object of the invention is said to be to provide for automatically and constantly controlling the pressure in the liquid supply pipe and generating coil, so that the pressure in the coil shall be substantially uniform and of the proper degree to permit the gas-yielding material to be converted into fixed gas while being passed through the coil or conduit, "whereby a uniform quality of fixed gas is made without undue strain or injury to the apparatus."

Street-Lamps.

ABRAHAM, A., of Berlin.

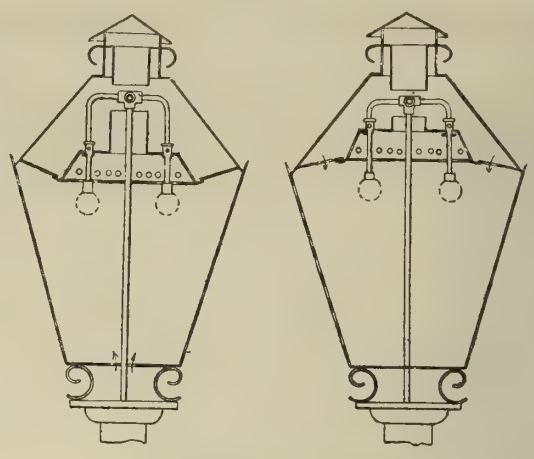
No. 25,300; Nov. 9, 1906.

This invention relates to means for converting ordinary street gas-lamps into lamps adapted for use with inverted incandescent burners "by placing within the lamp a sleeve-like casing abutting against or terminating in the reflector, the mixing-tube of the burner having its air-nozzle outside the casing and the latter having a central outlet pipe for waste gases."

The illustration shows a lamp in which the air supply takes place partially from the bottom, and another in which the air supply is entirely from the top.

At or about the height of the reflector, a sleeve-like casing is arranged, through which the inverted burners are passed and connected to the gas-supply pipe. The casing consists of a truncated conical shape closed at the top and terminating in a central chimney. At the bottom it is closed by a plate somewhat extended laterally so that it offers a support for the reflector, which bears loosely on the support; so that it may be used with its concave or convex side, according to the purpose of the lamp. The inverted burners are passed through the casing so that the air-supply nozzles are outside the latter; whereas the burner-heads and incandescent bodies pass through comparatively wide apertures in the bottom plate.

When a partial air-supply takes place from below, outside air is conducted to the burners directly from below; whereas other air is supplied from a chamber formed, on the one hand, by the cover of the lamp-roof, and, on the other hand, by the reflector and casing. The gases of combustion are, however, compelled to ascend through the apertures in the bottom plate and pass out through the central pipe to the lamp ventilator. When, however, the air is supplied only from above, the reflector is provided with a series of apertures through which exterior air is drawn into the interior of the lamp



Abraham's Street-Lamps.

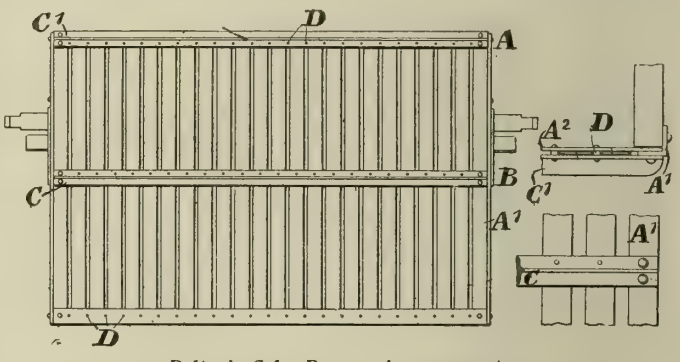
when the burners are ignited, and an upwardly directed current of gases of combustion is set up. In both constructions, the casing may with advantage be provided with openings arranged about the base of the conical wall.

Barrows or Trucks for Carrying Hot Coke.

BELTON, J. C., of Chester.

No. 26,360; Nov. 21, 1906.

Iron barrows, trucks, and the like, for carrying hot coke, &c., are usually constructed of a number of iron bars or plates rigidly held in a framework by rivets, and liable to bulging or buckling. This objection is intended to be overcome by the patentee so securing the bars plates as to allow of their free expansion or contraction—in the case of bars, by fixing them at one end while the other end is free, or by leaving both ends free and fixing the bars in the centre or at some other convenient point intermediate thereof; and in the case of plates, by forming in each plate two or more slots, engaging fixed pins or rivets, on which the plate can move.



Belton's Coke-Barrow Arrangement.

The patentee illustrates an iron tipping truck or skip such as is used for the conveyance of hot coke from the retorts in a gas-works to the coke yard. The enlarged details show in plan the corner A, and in side elevation a portion of the part B.

It will be seen that while all the bars are riveted to the T-iron C, only the flanged end piece A^1 is riveted to the T-iron C^1 and to the bottom of the framework. All the bars are merely spaced apart at the top and bottom by distance-pieces D. The bars are thus free to move, in their expansion and contraction, between the parts C^1 and A^2.

APPLICATIONS FOR LETTERS PATENT.

4535.—HINTON, E., and ANDREWS, F. A., "Bye-pass gas-cocks." Feb. 25.

4708.—SOCIÉTÉ ANONYME JOHN COCKERILL, "Gas-engines." Feb. 26.

4740.—BOUVIER, A., "Compressing gas." Feb. 26.

4758.—DAVIS H., and PEARCE. H. J., "Gas-fittings," Feb. 27.

4806.—BARBOUR, W., "Incandescent burners." Feb. 27.

4898.—ROLLIN, C., "Refractory blocks for gas-turbines." Feb. 28.

4911.—VILAR, H. DE, "Gas-generators." Feb. 28.

5060.—BLAKEY, J. W., "Gas and air burners." March 2.

5086.—WRIGHT, J. W. B., and DARWIN, H., "Inverted lamps." March 2.

5108.—COX, W., STAPLES, W., and GEORGE GLOVER AND CO., LTD., "Prepayment apparatus for delivering gas and like fluids." March 2.

5135.—GALILÉ, J., "Incandescent burners." March 2.

5137.—BROCKE, F., "Regenerative furnaces." March 2.

According to the "Daily Telegraph," Professor Poe, of Norfolk County, Virginia, has perfected an apparatus which will bring the apparently dead to life, and has secured a capital of £20,000 for an organization to exploit his discovery. This apparatus restores vitality by pumping carbonic gas from, and oxygen into, the lungs. Cases of apparent asphyxiation by gas, drowning, or death from overdose of anæsthetics, Professor Poe says, can be brought back to life that would otherwise be lost.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

High and Low Grade Gas.

SIR,—It is often said that, in all matters of controversy, the Editor's decision shall be final. Unfortunately, I am about to commit the unpardonable offence of denying that we have arrived at that stage where a decision can be final on the question of High *v.* Low Grade Gas.

All published results that I have hitherto had the privilege of perusing have violated almost every principle necessary to arrive at reliable comparative results. I trust, Sir, you will not look upon this letter as a serious form of "sacrilege" on my part for daring to dispute the correctness of the opinions of "representative progressive men" who have given their verdict on this question. I notice, to use military parlance, that at Manchester the opponents of high-grade gas were occupied most of the time in shelling the woods; the fort was never touched. You will perhaps agree with me, that the shells would make quite as much noise; but the ultimate effect hardly warranted the reckless waste of ammunition.

With your permission I propose to show that, in order to make comparative tests, it is necessary to consider causes that have certainly been neglected—if not quite ignored—up to the present time.

We will assume (and it is within the realm of possibility) that we are making gas consecutively of 20, 16, and 10 candle power, and consuming it in an ordinary incandescent burner at 2 inches pressure. Does it not at once appeal to you that it could not be the correct pressure for the three gases; for this reason, whatever the velocity of the gas on leaving the nipple and discharging into the mixing-chamber of the burner, that will determine the amount of air that will be drawn in through the air-inlets by the gas? If the quantity was correct for 20-candle gas, it could not be the right proportion for the other two, and *vice versâ*.

It can easily have happened in the case of Mr. Allen's tests that the pressure was more favourable to the 16 than to the 20 candle gas, which will account for the very slight difference in illuminating and calorific power.

Summing the matter up as briefly as possible, we obtain the following: "From a consumer's standpoint, that gas is the best which requires the largest volume of air, with the least volume of gas, for its perfect combustion." I need not labour the point that, the richer the gas, the more air proportionately will be required for its combustion.

Turning to the second phase of the question—*i.e.*, the manufacture of gases of varied grades—there are certain conditions that must be observed if reliable results are to be obtained. I take it that if a coal will produce a gas of 16 candles, without having to force its way through a seal or depend upon the action of an exhauster, 16 candles is the commercial illuminating power of that gas. Now to raise it to 20 candles by means of carburetted water gas we may get the candle power on the photometer, but will the constituents of the 20-candle gas produce the same proportionate results in an incandescent burner as the 16-candle gas direct from the coal? I am certainly of opinion that it would not, but am not in a position to make a thorough test.

Again to reduce the natural candle power of a gas by drawing from the retorts, you know very well that the composition of that gas does not bear any true proportion to the former. So to compare gases under the conditions usually adopted, cannot give us the results that we seek. It is perhaps as well to follow out the good old custom in regard to gas making that is usually followed by the judicious toper who says, "Never mix your drinks." If we want reliable comparative results, we must not "mix our gases."

Barnoldswick, March 9, 1907. J. W. THOMPSON.

[Our correspondent's letter has the appearance of having been written with all seriousness, and must therefore be treated in like manner. First of all, it may be said we give welcome to the communication because we have not arrived at that autocratic state when we arrogate to ourselves the right to final decision in matters of controversy; and therefore Mr. Thompson may be acquitted of any "unpardonable offence"' in denying that we have attained that stage when a decision can be final on the question of "High *v.* Low Grade Gas." Mr. Allen suggests that in Liverpool they have done so; most of the speakers at the Manchester meeting claim to have done so; expert opinion in Glasgow and Edinburgh is in favour of the down-grade in respect of illuminating power; the same in most other parts of the country; while the movement and experience in London and the suburbs give endorsement. If we except a few isolated units of the gas profession, there has already been final decision as to whether the future of gas supply must be on the lines of high or low grade illuminating gas, and judgment is favourable to the latter. We wish the remainder of Mr. Thompson's letter had been a little more explicit. The question of High *v.* Low Grade Illuminating Gas does not concern incandescent burners alone; it concerns the whole range of uses to which gas is applied. In short, it is a question as to the gas that is most economically suitable for all general purposes. In dealing with gas pressures for different qualities of gas, our correspondent does not extend consideration to the power of regulation at the gas-tap, by the air-collar on the burner, and by the means of gas control that some of the burner makers are providing. If Mr. Thompson has read Mr. Allen's paper attentively, he will discover that that gentleman in his tests, by adopting a fixed rate of gas consumption for the different qualities of gas, went quite athwart our correspondent's notions as to the proprieties in method in making comparative tests. It is, of course, accepted that the combination of carburetted water gas with coal gas does lower the average calorific value of the gas. Mr. Thompson is of opinion that 20-candle gas composed of an admixture of coal and water gas will not give the same proportionate results in an incandescent burner as 16-candle gas direct from coal. As Mr. Allen uses a fairly large proportion of carburetted water gas at Liverpool, we need not further pursue our correspondent's argument, seeing that, from the foregoing statement may be deduced the admission that Mr. Allen's paper and tests supply nothing that can assist our correspondent to any "final decision" on the main question. The determination of the policy of supplying lower illuminating power gas than hitherto has not been reached without a large amount of research on the way.—ED. J. G. L.]

Examinations in "Gas Distribution."

SIR,—From your report of the recent meeting of the members of the Midland Junior Gas Association, I notice that (in conjunction with other Junior Gas Associations) they propose to approach the City and Guilds of London Institute with regard to examinations in "Gas Distribution."

I may state that such a proposal has already received the consideration of the Council of the Institution of Gas Engineers; and that the consent of the City and Guilds of London Institute to the suggested new examinations has just been communicated.

The title of the new examinations will be "Gas Supply," a draft of the syllabuses of which, recommended by the Council of the Institution, is now receiving the consideration of the Board.

39, *Victoria Street, S.W.*, *March* 7, 1907. WALTER T. DUNN, Secretary.

Mr. Brackenbury on the Prevention of Corruption Act.

SIR,—In reading over the "JOURNAL" account of my "Prevention of Corruption" paper, I see on p. 616 (four lines from the top of the first column) the word "first" has been used in mistake for "third," which I think you will find in my MS. It relates to the four possible interpretations of the phrase "with intent to;" and it is the third (not the first) of the meanings that I should be made to say was "the most consonant with common sense." Further, as mentioned in my paper, there is judicial authority for the third meaning—see the extract from Bowen, L.J., given in the MS.

As this is rather important, I should be glad if you would rectify the mistake. The "intent" need not be the "sole" intent, but must be the "dominant" intent.

March 7, 1907. C. E. BRACKENBURY.

The Cerofirm Mantle.

SIR,—I have received a letter this morning from the holder of the option for the British patent in connection with the Cerofirm mantle, and learn that as soon as the Company is registered, and the factory is ready to turn the mantles out, it will be put on the British market. I am writing thus in order to correct a statement which I made in my address before the Midland Association of Gas Managers, to the effect that, owing to certain patent rights, this mantle cannot yet be put on the British market. This information was obtained from a source which I believed to be reliable.

Stafford, March 8, 1907. HUBERT POOLEY.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Colne Valley Water Bill, Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, Portishead District Water Bill.

The opposition to the Devonport Corporation Bill, Heywood and Middleton Water Board Bill, and Newquay and District Water Bill has been withdrawn.

HOUSE OF COMMONS.

Thursday, March 7.

THE SUPPLY OF WATER GAS.

Mr. REMNANT (in the absence of Mr. Harmood Banner, who had intended to carry into effect the recommendations of the Departmental put the question on the paper) asked the Home Secretary whether he Committee to control the supply of "poisonous gas" for heating and lighting purposes which does not possess a distinct and pungent smell.

Mr. LLOYD-GEORGE: It is presumed that the question of the honourable member refers to the Departmental Committee appointed by the Home Office in 1898 to inquire into the manufacture and use of water gas and other gases containing a large proportion of carbonic oxide. It is not my intention, as at present advised, to introduce a Bill on this subject. I may add that the Board of Trade are not aware that any gas which does not possess a distinct and pungent smell is used for heating and lighting purposes; and all the gas used for these purposes in the United Kingdom, whether coal gas alone or in admixture with water gas, is more or less poisonous.

The following further progress has been made with Bills:—

Bills read a second time and committed: Gas Companies (Removal of Sulphur Restrictions) Bill, Mitcham and Wimbledon District Gas Bill, Worthing Gas Bill.

The Select Committee on Standing Orders have reported that the

parties promoting the Boston Spa Gas Bill should be permitted to proceed. The Bill has accordingly been presented and read the first time. The Committee have also reported that the Burnley Corporation should be allowed to deposit a petition for a Bill.

The Armagh Urban District Council Bill, Llandrindod Wells Gas Bill, Mitcham and Wimbledon District Gas Bill, and Skanklin Gas Bill have been referred to a Select Committee, consisting of Sir Frederick Banbury (Chairman), Mr. Fiennes, Mr. Raphael, and Mr. Walter Hudson; to meet to-day.

The Falmouth Gas Bill, Maidstone Gas Bill, and Worthing Gas Bill have been referred to a Select Committee, consisting of Mr. Hutton, Mr. G. A. Gibbs, Mr. Agnew, and Mr. John Johnson; to meet to-morrow.

MITCHAM AND WIMBLEDON DISTRICT GAS BILL.

Court of Referees.—Tuesday, March 5.

The Court of Referees of the House of Commons, presided over by Mr. EMMOTT, the Chairman of Committees, considered to-day the claims of the Croydon Rural District Council and of the Mayor, Aldermen, and Burgesses of Wimbledon to be heard in opposition to the Mitcham and Wimbledon District Gas Bill.

Mr. LEES, the Parliamentary Agent for the two Local Authorities, said that in each case the only portion of the petition objected to was paragraph 16, in which it was submitted that further protection should be afforded them in relation to the breaking-up of streets and roads, to the depth at which the pipes of the Company should be laid, and to their sewers and mains. The Company were incorporated in 1867, and were granted a Provisional Order in 1892. The capital thus obtained was exhausted; and power was now sought to raise an additional £400,000, to reduce the illuminating power of the gas, to buy lands for further works, and so forth. With the new capital extended mains would be laid throughout the districts of the two petitioning Authorities. The character of these districts had absolutely changed in the last forty years; and the two Authorities therefore asked for further protection. They alleged that the Bill related to the lighting of their areas, and that they might be injuriously affected by it, and that they were entitled, therefore, under Standing Order 134a, to absolute *locus standi*. He suggested also that under this Standing Order it was not competent for the Court to cut down the *locus* in any way.

Sir CHANDOS LEIGH (Speaker's Council): You say you come under the mandatory Standing Order?

Mr. LEES: Yes. The Standing Order says "shall be entitled to be heard."

Sir CHANDOS LEIGH: Our hands have always been a good deal tied by this Standing Order. In face of what Mr. Lees has said, I do not see how the promoters can get out of it.

Mr. LEES, continuing, asserted that the Standing Order, in the conditions it contemplated and which were here complied with, gave *locus* against "the Bill," not against a particular clause. It was absolutely necessary that the Local Authorities should have some control of the depth at which the pipes were to be laid, and so forth. Such protection had been given recently in the Hitchin Gas Bill to the County Council of Hertfordshire.

Mr. HUTCHINSON, on behalf of the promoters, said this was an astute, but transparent, attempt to review past legislation. The petitioners did not object to any portion of the Bill, but to the breaking-up of streets. The Company had power, under the Act of 1867, to break-up streets and lay pipes, subject to the provisions of the Gas-Works Clauses Acts; and the Bill did not propose to deal with that power in any way. Yet the petitioners said: "Allow us to go before the Committee on merits to show that provisions contained in the Act of 1867 should be amended or repealed." The proposition was monstrous. The Court had consistently held that no attempt could be made by a petitioner to review past legislation. The Standing Order referred to did not say that every authority alleging injurious affection should be heard against the whole of the Bill. If a Bill dealt with a number of matters and referred incidentally to lighting, surely it could not be contended that the local authority, because of the reference to lighting, would have a right to appear against the whole Bill?

Sir CHANDOS LEIGH: Have you any case under this Standing Order where we have allowed *locus*, but had limited it?

Mr. HUTCHINSON replied that he had not. Continuing, he said he wanted the Court to distinguish between the provisions of a Bill which came strictly within the meaning of the Standing Order—namely, provisions relating to lighting—and other provisions contained, not in the Bill, but in a previous Act which the petitioners thought should be amended.

The CHAIRMAN: You are taking powers in this Bill for a large amount of capital, some of which will (we may fairly assume) be used for laying mains.

Mr. HUTCHINSON: Yes; but I can lay mains without that capital.

The CHAIRMAN: Under what powers will you lay these mains?

Mr. HUTCHINSON: Under the Act of 1867, not under this Bill. There is no power in this Bill to lay additional mains.

The CHAIRMAN: Do you desire to differentiate between mains to be laid out of this £400,000 and those that have been laid during past years?

Mr. HUTCHINSON replied that he did not. Continuing, he said that if the Company chose to manage their undertaking in a particular way—a way that was lawful—they could lay further mains without coming to Parliament. If the shareholders, in order to evade such a monstrous proposition as had been put forward, chose, they could devote the whole of the profits to the laying of fresh mains.

The CHAIRMAN: We have to take it as it is.

Mr. HUTCHINSON: Certainly; and you have to look at the petition as it is. There are only two clauses in the Bill which specifically affect roads. I concede their *locus standi* against those.

Further discussion having taken place, the Court allowed the general *locus* asked for.

LEGAL INTELLIGENCE.

COUNTY OF LONDON QUARTER SESSIONS.

Clerkenwell, Thursday, Feb. 28.

(*Before Mr.* ROBERT WALLACE, K.C., *Chairman, and a Bench of Magistrates.*)

The South Metropolitan Gas Company's Assessment.

At the Sessions House, Clerkenwell, to-day, the hearing was commenced of an appeal by the South Metropolitan Gas Company against the assessment of their undertaking by the Assessment Committees of the Woolwich Union, the Greenwich Union, the Borough of Lewisham, and the Borough of Bermondsey. At the conclusion of the third day's proceedings, the further hearing was (as briefly recorded in the "JOURNAL" last week) adjourned *sine die*.

Mr. BALFOUR BROWNE, K.C., Mr. DANCKWERTS, K.C., and Mr. W. C. RYDE (instructed by Messrs. Budd, Johnson, and Jecks) appeared for the Company. The Counsel for the respondents were: For the Woolwich Union, Mr. CRIPPS, K.C., Mr. HORACE AVORY, K.C., and Mr. E. W. COX-SINCLAIR (instructed by Mr. E. W. Sampson). For the Greenwich Union, Sir RALPH LITTLER, K.C., Mr. MARSHALL, K.C., and Mr. R. C. GLENN (instructed by Messrs. Saw and Sons). For the Borough of Lewisham, Sir EDWARD BOYLE, K.C., and Mr. TYRRELL T. PAINE (instructed by Messrs. Newton, Lewin, and Levett). For the Borough of Bermondsey, Mr. HORACE AVORY, K.C., and Mr. R. W. HARPER (instructed by Mr. F. Ryall, the Town Clerk).

Mr. BALFOUR BROWNE, in opening the case for the Company, pointed out that they were appealing in regard to eleven parishes in four Unions. As the points to be raised would be in each instance very much the same, he suggested that the whole matter should be gone into in connection with the first case—that of Woolwich—so that there should not be four sets of opening speeches and four cross-examinations of the witnesses. The first case substantially covered all the points that were really going to be discussed; but it was not, of course, a consolidated appeal. Continuing, he explained that, under the Parochial Assessment Act, what had to be arrived at was the rent which might reasonably be expected from a tenant from year to year; and then they had to deduct therefrom the amounts that were necessary for insurance and other things to maintain the hereditament in a condition to command this rent. In the case of a gas-works—and more especially a large undertaking like the one in question—it was almost impossible to arrive directly at the rent which might be expected; and therefore it was necessary to proceed by another method to see, in fact, what it would be worth while for a tenant to pay for the hereditament. The first step was to take the gross receipts, which, in addition to the sales of gas, should include the rental from the meters (which had been held to be part of what a tenant of a gas undertaking would have to provide), and also, he argued, stoves and fittings. The total gross receipts from the four items he had mentioned came to £1,354,312; and from this had to be deducted bad debts, which, in the account year—the twelve months ending June, 1905—came to £3430, leaving a balance of £1,350,882. Turning to the tenant's expenditure, the most important item was, of course, coal, oil, &c., which came to £650,383 for the year. Then there was purification, £42,651—making a total of £693,034. But against the coal had to be put the receipts for residual products, which for the year named were £506,988, making the net cost of coal and purifying materials £186,046. Of course, there were other items—the largest being carbonizing wages £121,190—about which there could not be any dispute, as they appeared in the Company's accounts; but there were some figures on which the witnesses did not agree. A sum of £42,092 appeared under the co-partnership scheme; and this was clearly wages—it was the profit shared with the employees. Repairing and renewing fittings—5 per cent. on £345,938—£17,897, was a matter he would have to explain afterwards. Tenant's maintenance was put at £71,403; and altogether the working expenses came to £656,537, after deducting the £506,988 for residuals. Rates and taxes over the whole undertaking amounted to 7s. 11½d. in the pound, which came to £64,085—thus making a total expenditure of £720,622. Now he came to one of the matters which was really in dispute—tenant's capital. A tenant would require a certain amount of money in hand to go on with; and his contention was that the sum so needed would be five months' working expenses. To arrive at what this would amount to, they would have to take the £656,537 he had mentioned, and add the receipts from residuals £506,988, and the £64,000 for rates and taxes. This gave a total of £1,227,525 for the year, five-twelfths of which would be £511,469. It would not, however, be fair to take this figure alone; they must consider what would be coming in from residuals. He calculated there would be in hand four months' residual receipts, or equal to one-third of the whole £506,988. This was £168,996. Then three-and-a-half months' automatic receipts would come in quickly; and the year's total being £414,334, this would equal £120,847. There was also credit allowed from sundry tradesmen £34,411. Adding these three items together, there was a sum of £324,254 in cash, against the five months' outgoings, which gave the money the tenant would require as £187,215. The present value of the ordinary meters and main cocks—not their cost, because the tenant would merely pay what they were worth when he took them over—was put at £148,617; while that of the slot-meters, cocks, and padlocks, was reckoned at £256,207. The cost of fixing ordinary meters, at 2s. 10½d. each, was £14,760; and of the slot-meters at 1s. 6d. each, £13,655. This made a total in connection with meters of £433,239. To this had to be added the present value of 226,249 shelves on which meters were placed, which was put at £4242. For stoves and fires on hire, including main-cocks and unions, a present value of £362,758 was included; while the cost of fixing 68,638 stoves, at 6s. 3d. each, came to £21,449. This made the total capital in stoves, after allowing for depreciation, £384,207. There were also 157,174 galvanized iron stove-stands, which were reckoned in at

£5902. The fitting and piping for 182,073 prepayment gas-meter installations, at 38s. each, came to £345,938. But this would not be the value to an incoming tenant; so he halved it, and put down £172,969. Other items were: Sundry stores, including purifying materials, £58,793; six weeks' coal, £75,044; unsold residuals, £65,374; tools and implements, £105,492; and bankers' balance, £25,000. Adding all these figures up, he arrived at £1,517,477, which he said any tenant of the undertaking would have to find in money first, or in tools, meters, and other things. The question was, What would the tenant expect out of the concern for finding this money? Taking all things into consideration, he contended that, for a tenant who was conducting a business from year to year, 10 per cent. was fair for profit, 5 per cent. as interest on the money he had to find, and 2½ per cent. for the risk a tenant might run. Under these circumstances, he claimed upon the tenant's capital 17½ per cent. This amount was invariably allowed in this Court; and he knew of no instance where any other percentage had been fixed. Under the Parochial Assessment Act, the Court had to find "what might reasonably be expected;" and it would not be reasonable to expect a tenant to take over the works for less than 17½ per cent. In the case of the *Queen v. Lee*, it was found that "17½ per cent. was a fair percentage to allow on tenant's capital, for interest on money, for his own trouble and skill, and for provision against risks and casualties." In the *Midland Railway Company v. Assessment Committee of St. Mary's, Islington*, it had also been held that the proper amount of interest on tenant's capital was 17½ per cent. He agreed that this was under the then existing circumstances. But this Court, down to the most recent times, had not altered the percentage; and he understood this was because, in their view, the circumstances were the same now of a tenant taking a gas-works as they were in the cases he had referred to.

The CHAIRMAN: You do not contend that it is not open to this Court, if, having regard to all the circumstances, they should come to the conclusion that it is too large an allowance, to alter it? It is a question of fact as to what was recognized by the Court under the circumstances.

Mr. BALFOUR BROWNE: It is perfectly competent to this Court, if they come to the conclusion that a tenant might be expected to do it at 15 per cent., to put it at that; but, at the same time, it is open to you to put it at 25 per cent. Continuing, he said he had taken the 17½ per cent. on £1,450,000 (which was £67,000 less than the tenant's capital at which he had arrived); and this gave £253,750. Coming to the "statutable deductions," the first was repairs and maintenance of works, plant, mains, and service-pipes. To arrive at this he divided the total amount of maintenance for the five years to June 30, 1905, by the total gas sold in the same period; and this gave 5·688d. per 1000 cubic feet of gas sold. Applying this average to the quantity sold in the year to June, 1905, he got £285,611, from which he took off £71,403 for repairs included in the working expenses, leaving £214,208. As to insurance, the total expenditure upon the works had been £4,825,168; and if £1,000,000 of this property was insured at 2s. 6d. per cent., the cost would be £1250. Therefore the total amount of statutables which were necessary to be expended for insurance and to retain the hereditaments in a condition to command the rent was £215,458. To summarize the figures, the gross receipts were £1,350,882, the working expenses £720,622, and the net receipts £630,260. The 17½ per cent. on tenant's capital—the occupier's share—came to £253,750, so that the gross value was £376,510. This was the rent which might reasonably be expected from a hypothetical tenant to a hypothetical landlord. The Act said that it was this rent, deducting therefrom the statutables, that gave the rateable value. The statutables in this case were £215,458; and deducting this from the gross estimated rental of £376,510, left a rateable value of £161,052 for the whole undertaking, which was made up of manufacturing stations, unproductive mains, and productive service-pipes and mains. The rateable value of the manufacturing part was agreed at £100,708, and that of the unproductive or trunk mains at £7907—together £108,678. Deducting this from the £161,052, which he gave as the rateable value of the whole undertaking, left £52,374 for the productive mains. In conclusion, the learned Counsel again quoted the case of the *Queen v. Lee*, to show that meters were held to be part of the tenant's capital; and he argued that in this respect stoves could not be distinguished from meters.

Sir RALPH LITTLER said that before evidence was called, he would like to point out that his learned friend was supplying to the Court figures based on one half of 1904 and one half of 1905. The second period, of course, was not in the quinquennial. The respondents had treated the whole thing as being in 1904, and had taken the figures of the complete quinquennial.

Mr. BALFOUR BROWNE said the Company had taken the last available complete year—down to June, 1905.

The CHAIRMAN remarked that he was afraid both sides were entitled to give evidence on their own figures.

Mr. *Arthur L. Ryde*, examined by Mr. W. C. RYDE, put in a valuation based on the accounts for the year ending June, 1905. This contained the figures quoted by Mr. Balfour Browne in his opening statement, and showed the rateable value of the productive mains to be £52,374, which, witness said, was equal to 3·867 per cent. of the gross receipts of £1,354,312. He had depreciated the slot meters by only 20 per cent., as against 25 per cent. for the ordinary meters, because on the average they were much newer. For stoves and fires he had allowed 30 per cent. depreciation, because in the first place they were older, and in the second place they got into a very bad condition. With regard to the 50 per cent. depreciation on the fittings and piping, they would be worth more than that to the Company; but an incoming tenant was what they had now to consider. A six weeks' stock of coal and oil would be necessary for the tenant; and as to residuals, they generally had to wait a month, on an average, before they got the money for them. The £67,000 which had been deducted from tenant's capital was to allow for possible errors. For the past twenty years, he always claimed 17½ per cent. on tenant's capital; and he thought he might say that over 90 per cent. of the decisions which were known were based on this figure. Applying his rateable value of £52,374 for the productive mains of the whole undertaking, would leave for Woolwich £1218; and adding this to the agreed figure of £259 for the unproductive mains, he arrived at a total of £1477, as against the £2150 (including the agreed £259 for unproductive mains) which was claimed. His evidence therefore brought out a considerable margin below the claim of the Company in this case. In their notice of appeal, the Company claimed a rateable value of 6 per cent., or £1891, for the productive mains, whereas his calculations showed a rateable value of 3·867 per cent., of the gross receipts.

The CHAIRMAN: You are actually allowing much more than you are proving.

Mr. BALFOUR BROWNE: Yes. We cannot get below the 6 per cent., we know, in this appeal; but we say we ought to get it upon the figures we give.

Mr. DANCKWERTS: We have a margin of over 2 per cent.

Mr. RYDE (to witness): Sir Ralph Littler said that he proposed to put in a valuation based, not on the year ending June, 1905, but on an average of years. The price of gas has not remained at a constant figure during the past five years, and it would be impossible to take any fair average over a period of years in which, quite apart from the different quantity of gas sold, the price of the gas varied from year to year?

Witness: Until we see how he is going to get over that difficulty, I do not know whether it is reasonable or unreasonable; but it would never be a rent from year to year, as the Act says.

Cross-examined by Mr. MARSHALL, witness said that if they wanted to arrive at the rent from year to year, they must take the latest information. If they were valuing for a number of years, they must take an average. The hypothetical tenant was to be a tenant from year to year.

Mr. MARSHALL: Therefore, when looking forward for a certain short number of years, would not the thing most likely to inform his mind be the history of the Company during an equal number of years immediately past?

Witness: Yes; that would be so if you had to get at the average rental value for the next five years. That is not my understanding of the definition in the Act.

Take the case of an ordinary business. A man wishes to become tenant of a business already established; would he be likely to confine his attention to the receipts and expenditure of one year, or would he not go, if possible, a little farther afield and see the history over a larger area?—He would inquire into more than one year.

Therefore, unless there is a restriction by statute, you think it would be a reasonable thing to do?—Yes, unless directed to do something else.

Is there anything which confines you to one single year, whatever the year may be, for the materials for assuming what a hypothetical tenant would give in the way of rent?—No, not in the statute, perhaps; but there have been cases which show you are bound to look at the latest information in the case of a Company which is growing.

But not shutting out earlier information?—No, of course not.

In further cross-examination, witness said that with regard to repairs he had taken an average over five years, because the Act specifically directed him to do so. Moreover, maintenance and repairs fluctuated more than anything else. In connection with these, the Act said, "deducting therefrom the average annual expense;" while in the other case the expression used was "tenant from year to year." Ten years ago, the gross receipts of the Company were £878,212, against £1,354,000; and then his valuation of the productive mains was £82,865, as compared with £52,374 in the present instance. This, however, was due to a variety of causes, one of which was that the parishes insisted on maintaining 5 per cent. on structural value for the works. While the percentage of total rateable value was known to vary, if one kept two-thirds as a stationary figure it stood to reason that the percentage of what remained must vary more still. On the last occasion when he gave a rateable value of £82,865, the Court fixed it at £140,272, which was 15¾ per cent. of the gross receipts. The main cause of the very large reduction now proposed by the Company was the growth of the prepayment meter business. The net receipts of the Company were earned now to a much larger extent by non-rateable property.

Mr. MARSHALL: If in the case of this particular Company you go on providing the penny-in-the-slot machines as rapidly as you have done lately, to the extent of £18,000 every half year, what is to prevent the rent of the landlord being extinguished altogether, according to your view?

Witness: You may take it from me that there comes what has been called a saturation point with these meters. The neighbourhood is nearly full up with them; and the Company are not providing them at the same rate as in the past.

The CHAIRMAN: Supposing that for any purpose the Company sold their gas so that there was no profit from the automatic meters, but a loss, and the greater part of the capital of the Company was in the meters, and it practically wiped out the rent, would you say that that is the law?

Mr. BALFOUR BROWNE: I should, my Lord.

The CHAIRMAN: I want the witness to say.

Witness: I do not quite agree with that.

Mr. BALFOUR BROWNE: As a matter of law, there is no necessity to protect the landlord's rent. If nobody will take the hereditaments, the landlord's rent is nothing.

The CHAIRMAN: I understood that to be the contention.

Sir RALPH LITTLER: If a man cannot get 17½ per cent., my friend says he will not take the premises. That is a strong proposition.

Further questioned, witness said everyone agreed that the amount of tenant's capital required to earn receipts per 1000 cubic feet of gas was immensely increased now beyond what it was ten years ago.

Mr. AVORY (in cross-examination): Do I understand that your proposition before the Court is this: The South Metropolitan Gas Company, who in 1896, according to the judgment of this Court, would have been willing to pay a rent of £140,000 as the rateable value for the directly productive mains or services, would, with the gross receipts increased by 50 per cent., now only be willing to pay, according to you, about £50,000 for the same property?

Witness: Yes; but there are many other factors. Meanwhile, the assessment of the works has gone on steadily increasing, making a much larger proportion of the total.

Whereas you are now asking for 3·867 per cent., have you settled some of the other appeals on a basis of 7½ per cent.?—Sir George Livesey did; I did not. We strongly advised him not to settle.

Mr. BALFOUR BROWNE: We are not asking 3·867 per cent., but 6 per cent. in this case. We are giving evidence that we have offered them too much; but we know that we cannot depart from the 6 per cent. which is stated in our appeal.

Mr. AVORY: Are you aware the price of gas always gets down to its lowest in the year before the quinquennial valuation?

Witness: The price of gas must fall with the expenses; and you may depend upon its being kept down to the lowest possible point, owing to the competition with electric light.

Friday, March 1.

Mr. *Ryde* was to-day further cross-examined at some length by Mr. AVORY on the figures now produced as compared with those put forward on the occasion of the previous appeal in 1896. Passing on, witness said he was aware that in the recent Ipswich case the Recorder found himself bound to hold that there was no distinction between stoves and meters and fittings; and it was on the ground that he could find no distinction between them that he stated a case. The Recorder in that instance also included at witness's instigation gas-fittings, in the shape of brackets and other fittings, which were supplied by the Gas Company to houses. As a matter of principle, there was no distinction between gas brackets or fittings of that description supplied by the Company and stoves and meters. They would have to be provided by the tenant of the gas-works in the same way that the Company had had to provide them. The consumption of gas would not have been stimulated in the way it had been, without the provision by the Gas Company of these articles.

Taken in hand by Sir EDWARD BOYLE, witness admitted that his figures in the 1896 appeal worked out to 9 289 per cent. of the gross receipts, while the Court fixed the amount at 15·75 per cent. When the total gross receipts of the whole undertaking were about £800,000, the rateable value fixed by the Court was £140,272; whereas now the gross receipts were £135,400, he said that the rateable value should be £58,000. This was because the deductions had grown at a greater rate than the receipts. Applying this to the parish of Lewisham, in 1895 the receipts there were £59,000, and the Court fixed the rateable value at £9310. In 1905, the receipts were £104,000 odd; and witness said £4000 was a sufficient rateable value.

Sir EDWARD BOYLE: Supposing you put the price down to 1s. 6d. per 1000 cubic feet, you will get very little rateable value then; but you would not lose anything, because you could put it up directly after the decision to 2s. 6d.?

Witness: You must not ignore the working expenses; the price follows the working expenses.

Re-examined by Mr. BALFOUR BROWNE, witness said, with regard to workmen's deposits, that he had not included these, because he did not think the tenant would get them. He did not think the workmen would deposit with a tenant such an amount as £50,000, or any sum. The principles on which his valuation of 1896 was based were the same as those which governed his present figures.

The CHAIRMAN: I understand, Mr. Avory, you are not contending that, supposing the circumstances are the same to-day, if the Company could show that the 1896 valuation should be a different one, they are precluded from doing it? Supposing that they had either omitted something or there had been a wrong conclusion in 1896, and the Court fixed a wrong percentage, there is nothing to prevent the Court to-day from fixing their own valuation?

Mr. AVORY: Not if the Court is satisfied there was any mistake made in 1896.

Re-examination continued: The suggestion that the accounts had ever been manipulated for the purpose of assessment was ridiculous. Thirteen parishes that were not appealing, out of twenty-four, had assented to a reduction.

Mr. *W. A. M'Intosh Valon,* examined by Mr. RYDE, also put in a valuation of the undertaking made by his firm, based on the accounts for the year ending June 30, 1905. This showed the rateable value of the productive mains to be £55,580, which was equal to 4·1 per cent. of the gas, meter, and stove rentals (£1,354,312). The total working expenses he allowed as proper in a rating calculation were £1,144,924; and deducting this from the £1,857,870 gross receipts (after deducting bad debts), left the net receipts at £712,946. He allowed 4½ months of the total working expenses as necessary for the tenant to have from the beginning of the year until such time as his receipts were sufficient to meet his outgoings; for a company of this kind would not expect to get in much money until the end of 4½ months. This came to £429,346. He credited the hypothetical tenant with the value of the whole of the residuals which were sold for cash in 4½ months; and so far as they were not sold for cash, he assumed that the receipts would be six weeks behind, and put down 3 months' credit. The total amount he allowed off the working expenses for residuals was £138,510. Then he included 3½ months' automatic receipts—£120,847—as it took a month or six weeks to go the round of the meters; and he also allowed the consumers' deposits—£21,598—for which he included 5 per cent. in the working expenses. The total of these deductions was £280,955, which, taken from the £429,346 already mentioned, left £148,391. To this he added the following items: Three months' rates (say), £16,000; six weeks' stock of coal, £75,044; stock of residuals, £65,374; tenants' portion of sundry stores and tools, including stock of meters and stoves and office furniture, £156,395; meters in use and fixing (allowing 25 per cent. depreciation on the ordinary, and 20 per cent. on the prepayment), £426,818; meter shelves, £4242; stoves and fires in use and fixing (less 33⅓ per cent. depreciation), £359,783; stove stands, £5902; prepayment fittings and pipes, £172,969; and cash at bank, £25,000. The Company were compelled by their agreement with the bank to keep a perpetual balance of £15,000 for meeting the difficulty of getting rid of the supply of coppers; and he thought in addition £10,000 was only a reasonable sum as a margin to work with. The total tenants' capital, adding all the figures just given, came to £1,455,918; but he had allowed 17½ per cent. on the round figure of £1,440,000. This gave a return to the tenant of £252,000. Previous to 1895, he had at times thought that some less amount than 17½ per cent. should be allowed off some of the items in the tenant's capital; but in 1896 he thought Mr. M'Connell made it quite plain that this Court would not look at anything less than 17½ per cent.; and since then, whenever valuing for one side or the other, witness had always allowed 17½ per cent.

The CHAIRMAN: Have you altered your own opinion?

Witness: I think I have, for the simple reason that the business is not what it was—money is much dearer, there is fiercer competition; and the way in which the Company have to conduct their business is very much more expensive. Therefore I think that now 17½ per cent. does apply to the whole.

Examination resumed: His statutable deductions he had taken at the same figures as the previous witness, Mr. Ryde. Repairs and renewals fluctuated a good deal; and unless a balance was struck by taking an average of five years, as the Act directed, one could not possibly arrive at a proper conclusion. He had deducted as tenant's portion (being included in working expenses) £55,433, from the total of £285,611 for repairs and maintenance, making the amount £230,178. The reason he fixed upon this figure of £55,433, was because experience had shown it to be correct. It was a figure he had relied upon for a great many years. It was about one-sixth of the total, *plus* 7½ per cent. to cover the repairs to the Company's large number of barges. His total deduction for statutables, including repairs and insurance, was £231,428; and deducting this from the gross value, the rateable value *plus* rates was £229,518. Deducting the £65,332 for rates from the figure for rateable value *plus* rates, left the rateable value of the whole undertaking at £164,186. This figure was within a very few pounds of 4½ per cent. on the actual capital outlay. It was an absolute net sum, after providing for repairs, maintenance, and everything; the property being kept up in a sufficient state to earn the rent.

Cross-examined by Sir RALPH LITTLER, witness repeated that Mr. M'Connell had distinctly told him that he would not allow anything but 17½ per cent. in that Court; and on the present occasion he had allowed this sum all round. It was also his own belief to-day that 17½ per cent. was the proper figure to allow. Since 1896, when Mr. M'Connell made the statement to which he had referred, witness had never put in any valuation he had made, either for an Assessment Committee or for a Company, at any other figure than 17½ per cent. In 1896, he gave on meters and stoves 12½ per cent.; and he had given his reasons for the alteration he had now made. Witness was then questioned at length on his figures in 1896—when he appeared on the other side—as compared with those he now gave. He said it had been decided, he believed, that mains belonged to the landlord and meters to the tenant; and on this principle he valued. One reason was that the meter was removable, at the pleasure of the tenant or the occupier, and the main was not.

In re-examination by Mr. BALFOUR BROWNE, he said it was a natural thing for an incoming tenant to take over the residuals of the outgoing; he must do so. Otherwise he would not have any residuals possibly for three months to sell, and he would not have any to carry on his business with, which he must have. If the 17½ per cent. was the right figure, the tenant wanted it on all his capital. It did not matter whether the capital was in the bank, where there was no risk, or in tools or coal.

Saturday, March 2.

The CHAIRMAN, at the opening of the proceedings, said Mr. Balfour Browne had told them on the previous day that the figures which the appellants had put forward with reference to the productive mains would represent 6 per cent. The figure arrived at by Mr. Ryde in his valuation was 3·867 per cent. of the gross receipts, representing a rateable value of the mains of £52,374. The 6 per cent. on his basis would represent £87,000, or something like that—a difference of some £35,000 or £36,000. As he understood it, this was calculated on 17½ per cent. as the occupier's return on capital; and taking this figure for one moment, it represented with regard to working capital a sum of about £150,000 or £160,000 to be cut off before the appellants would be in the wrong.

Sir RALPH LITTLER remarked that the Court decided upon 15 7 per cent. of the gross receipts as the rateable value in the last appeal; and now Mr. Ryde reduced this to 3·867 per cent. The 15·7 per cent. was the judgment of the Court, not a valuer's figure.

Mr. *E. H. Stevenson,* examined by Mr. RYDE, said he had made a valuation for rateable value of the whole undertaking and the allocation to the parishes concerned in the appeals. He put the gross receipts at £1,350,882; and the working expenses, *minus* rates, at £642,256. This made the net receipts, *plus* rates, £708,626. To arrive at the tenant's capital, he put five months' working expenses (*minus* rates), residual products, and rates and taxes, which came to £505,935, and deducted from this four months' receipts for residual products, 3½ months' prepayment meter receipts, and an amount due to sundry tradesmen for tenant's stores. These deductions came to £328,584, and left £177,351, to which he added the following: Meters at present value fixed, £410,122; meter shelves, £4242; stoves and fires on hire fixed at present value, £359,777; stove stands, £5902; fittings and pipes in houses, £172,969; sundry stores, £50,903; stock of coals, six weeks' average, £75,044; stock of material for purifiers, £7890; unsold residuals, £65,374; tools, implements, and furniture, £105,492; cash at bankers, £25,000. This made a total of £1,460,066; but taking the tenant's capital at (say) £1,400,000, the occupier's share thereon—at 17½ per cent.—would be £245,000. The statutable deductions—for repairs, &c., £285,611, less £57,122 attributable to tenant, and for insurance £1250—he put at £229,739. Deducting the tenant's share of £245,000 from the net receipts, there was left a gross value, *plus* rates, of £463,626. As shown, the statutable reductions were put at £229,739, which made the rateable value, *plus* rates, £233,887. Taking from this the rates (at 7s. 11½d. in the pound) £66,576, there remained £167,311 as the rateable value of the undertaking, which, less the agreed sum of £108,678 for the works and trunk mains, left the rateable value of the productive mains at £58,633, or 4·33 per cent. on the £1,354,312 gross

receipts. His figure for the value of the meters he arrived at by taking 33⅓ per cent. depreciation off the ordinary meters and 5 per cent. off the prepayment ones. Thus his total was about £23,000 less than Mr. Ryde's. All his figures were based on the undertaking as a going concern. He had allowed 17½ per cent. on tenant's capital, because he was accustomed to do so now. He had allowed it to the local authorities in the Water Board cases, and he had taken it for companies as well. This figure was generally allowed in practice, though there were a few cases in which it was not. As to the statutable deductions, he had followed the same method as the other witnesses in taking the average of five years' repairs and maintenance. and reckoning it out on the consumption of the account year. This was the only proper way, as one year the Company would spend a much larger amount than another.

The CHAIRMAN: You do not dispute this method of doing it?

Sir RALPH LITTLER: We agreed five years is the proper method, assuming the right amount to be found.

In further examination, witness handed in a table showing the interest received on capital employed by the landlord, based on Mr. Ryde's valuation. The capital employed by the Company on June 30, 1905, was £5,096,545, from which had to be deducted the amounts allowed as depreciation upon chattels in the tenant's capital—meters and shelves, stoves and fires and stands, and fittings and pipes—£445,408, leaving as depreciated capital £4,651,146. Deducting from this the tenant's capital as claimed by Mr. Ryde (£1,517,477) there remained £3,133,669 as the balance of capital employed by the landlord. The rateable value or rent, as found by Mr. Ryde, was £161,052; and this was 5·14 per cent. upon £3,133,669. This was a percentage which any landlord of a works or factory would be glad to get as rent on a full repairing lease. The tenancy in this case was better than that—being a perpetual full repairing lease, *plus* the renewing of the structures and plant when worn out. It was therefore a good rent for the landlord to receive on his invested capital. If he applied to the landlord's capital his own rateable value, being slightly above Mr. Ryde's, it would give a little more than 5·14 per cent. He thought there was not anyone who would not build a factory if he was certain of letting it year in and year out for ever at over 5 per cent. The 5·14 per cent. was an absolutely net figure, because all depreciation, repairs, renewals, and insurance were provided for.

Cross-examined by Sir RALPH LITTLER: His chief reason for allowing the 17½ per cent. was that this figure was usually taken. It was not what the tenant received, because he had to replace a considerable amount of depreciated capital during his tenancy. Probably the 17½ per cent. in this particular case represented a return of about 14½ per cent. to the tenant. The Company had to spend, or rather the tenant would have to spend—and could not get out of it, as a statutory concern—about £120,000 a year on new prepayment meters, fittings, stoves, ordinary meters, and such things. At the end of the tenancy he lost one-third; and this had to be replaced out of any profit he earned. He agreed with Mr. Valon that tenants must have this 17½ per cent. as an irreducible minimum, whatever effect it had on the landlords. If the landlord had a property which would not bring him in a rent, he was to be pitied; but the rent had to be fixed under a particular Act. It was not a question of bargain between two people.

Sir RALPH LITTLER: Supposing the result of the penny-in-the-slot meter increase were to bring the landlord's rent to nothing, would the tenant still get 17½ per cent.?

Witness: In my opinion, unless the Courts in the meantime settle a lower percentage than has been already settled, the landlord would not get anything.

Cross-examination resumed: The connection in the case of a slot-meter was exactly the same as in that of an ordinary meter. In all cases service-pipes (unless laid through a long distance of private land) were provided by the Company up to the meter; and sometimes if a customer was going to have a stove, the Company themselves would put in a pipe to it.

Cross-examined by Mr. CRIPPS: The Gaslight and Coke Company and the Commercial Company paid more in rates and taxes per 1000 cubic feet of gas sold; but this was to be expected as the charge upon their capital account per 1000 cubic feet sold was higher than that of the South Metropolitan Company.

Mr. AVORY cross-examined witness to show that one difference between ordinary and prepayment meters was that with the former the pipes in the house were always charged with gas, whereas with the latter there was no gas passing through unless the consumer chose to put in a penny; but witness replied that many people turned off the main-cock of ordinary meters at night, while with prepayment meters there was nearly always gas in the pipes, because another penny was put in before the previous pennyworth of gas was quite consumed. In answer to further questions, he said he should not include mantles sold by the Company as part of the tenant's capital. They belonged to a subsidiary trade. Glass globes, however, were included, as it was part of the Gas Company's business to supply fittings, and these carried the globes with them. Counsel repeatedly asked witness why, if he included globes in his item of fittings in tenant's capital, mantles should not also be included; and at last

Mr. DANCKWERTS said: My learned friend may take it they should be included according to our view; but we have not done it.

Re-examined by Mr. DANCKWERTS, witness said his view was that any tenant who carried on the business of the Company was bound to invest in slot meters and stoves. Somebody must find them—the consumer could not, the landlord would not, and the tenant therefore must. He saw absolutely no difference between the use of slot meters and ordinary meters. He saw no difference in principle between turning on the gas by means of a penny and by means of a handle. He was aware of the decision of the Court of Appeal that "fittings" meant stoves and fittings; and he could see no difference, in point of principle, between a stove and any other fitting for the consumption of gas. Fittings were let on hire in connection with the slot meters.

The CHAIRMAN: Is it not after all a subsidiary undertaking? Could not the tenants purchase globes, pendants, mantles, and everything of that kind for their own use in the way other people do?

Witness: They will not do it.

Mr. AVORY: I want your Lordship to ask witness this question: Is there anything to prevent the ordinary tenant or consumer from providing his own gas-stoves if he likes?

Witness: Nothing. A great many do; but none of the prepayment consumers. A great many people in really good houses hire their gas-stoves for heating and cooking.

Mr. *Frank Bush*, the Secretary of the Company, examined by Mr. DANCKWERTS, said that for the year 1905 the cost of each prepayment installation was 38s. 2d.; and for the previous year it was slightly more. The Company did some of the work themselves; but in addition they employed a number of contractors. Seven or eight of them charged 28s. for finding all the barrel-pipe that went in the houses and for the labour. He believed 16s. was for the pipe, and 12s. for the labour. Contractors had put up 9119 sets, for which the Company paid them £14,361. This came out at an average cost for piping and labour of 31s. 5d. So that there must have been some extra points put in. If to this was added 6s. 9d., the cost of the fittings, the 38s. 2d. he had mentioned was arrived at. For the year 1904, the cost was 38s. 8d. Though they were now only paying the contractors 28s., there had been years when they paid 30s., 32s., 34s. 6d., and even 35s. The Company's books showed that the slot-meter collection week by week for the account year came to £414,333. Witness produced a table showing that the outstanding accounts and wages for the half year ended June 30, 1905, amounted to £49,324, which sum Mr. Ryde had divided up. Continuing, he said that, in order that they might get rid of their large number of coppers, the Company had to arrange with their bankers to keep a fixed balance of £15,000; and in addition, they paid them £1000 a year.

Mr. AVORY announced that the respondents would reserve their cross-examination of this witness.

The hearing was then adjourned *sine die*.

Sequel to a Gas Explosion.

At the Wandsworth County Court, on Monday last week, Mrs. Sarah Dean, of Farthing Lane, Wandsworth, brought an action to recover damages from the Wandsworth and Putney Gas Company for injuries she received from an explosion caused by an escape of gas. She said that on the 28th of December last, while she was passing the corner of Atheldene Road, Wandsworth, an explosion occurred, and she was thrown to the ground. She was very much injured, and had been receiving medical attention ever since. It was found that the explosion was due to an escape of gas from a main belonging to the Company. Mr. Williamson, who keeps a shop near the spot where the explosion occurred, said a fortnight before the accident he smelt escaping gas, and telephoned to the defendants, asking them to attend to the matter. The gas was entering his shop through a hole through which a telephone wire passed, and the Company's men plugged this hole up with putty. Mr. T. Harrison, an engineer, said it was possible that, as a result of the hole being plugged up, the gas collected in the telephone box outside. It then commenced to escape through the edges of the cover, and someone threw down a lighted match, and the explosion followed. Mr. W. R. Pether, a Consulting Engineer, expressed the opinion that it was an extremely negligent act on the part of the defendants' servants to plug up the hole. Mr. Borewood, an Inspector in the service of the Company, said the men did a perfectly proper thing when they plugged up the hole, though he admitted that the plugging would cause the gas to accumulate in the ground. The plaintiff was awarded £25 damages, with costs.

Gas Profits at Lincoln.

In bringing before the Lincoln City Council a recommendation of the Gas Committee that the sum of £4000 should be appropriated out of their profits in aid of next year's general district rate, the Chairman (Alderman Wallis) gave some particulars of the operations of the undertaking in the twelve months now closing. He said the total receipts were given as £45,774, as against £45,643 last year; and the expenses as £33,733, against £34,621. This left a gross profit of £12,041, as compared with £1021. Out of this they had to pay interest on stock, sinking fund, and other charges, amounting to £7962, leaving an estimated surplus of £4079. The figures given, he explained, were only rough ones; and the full particulars would be obtainable when the accounts of the Committee were made up. They were, however, satisfied that they would have the £4000 to pay over. Mr. Mills congratulated Alderman Wallis on the year's trading, and asked if the Committee would take into consideration the question of supplying gas-cookers free. Alderman Wyatt added his congratulations, and said the state of the Gas Committee's affairs must be satisfactory both to the Corporation and to the consumers and ratepayers. They were much obliged to the Chairman (Alderman Wallis) and the Manager (Mr. John Carter). Mr. Pennell, in tendering his acceptance of the £4000 on behalf of the Finance Committee, said it would be very useful; and he hoped it would be the means of their not being compelled to raise the rate for the coming year. Alderman Wallis remarked that the question of free cookers had already been considered by the Committee; but they were not at present prepared to recommend them. They, however, hoped in the near future they would have something to propose in this direction. The Mayor (Col. J. S. Ruston) congratulated the Committee on the splendid results shown, and the recommendation was adopted.

Gas-Works for South Brent (Devon).—It appears that the proposed gas-works at South Brent will soon be an accomplished fact. The whole of the capital is available, a site for the works has been purchased, and as soon as plans and other preliminaries are complete the work will be put in hand. It is hoped that by next winter the little health-resort will be illuminated by gas instead of oil-lamps, with which the inhabitants have been quite contented for the past thirty years. The undertaking is a private one.

MISCELLANEOUS NEWS.

WORKING OF THE NOTTINGHAM GAS UNDERTAKING.

Opening of the Public Inquiry.

At a Special Meeting last January, the Nottingham City Council, after a long discussion (*ante*, p. 167), decided that a Committee of five members should be appointed to hold a public inquiry into the working of the gas undertaking during the past five years. At the following monthly meeting, the Committee was chosen; the members of it being: The Mayor (Alderman J. A. H. Green), Mr. S. Cook, Dr. Dabell, Mr. E. N. Elborne, and Mr. E. L. Manning. The first sitting was held last Thursday, when Mr. Frank B. Harris, the Assistant Solicitor to the Corporation, and Mr. J. H. Brown, the Gas Engineer, were the two witnesses called.

The MAYOR (at the outset of the proceedings), explained that with a view to a public inquiry, advertisements had been issued in the local Press and elsewhere, inviting those who desired to give evidence to send in their names, with a short statement of the points with which they wished to deal. Practically no statements had been volunteered, though one or two letters referring to points that were thought to be worthy of the attention of the Committee had been sent, and one or two gentlemen had expressed a desire to come before the Committee on one or two minor points relating to details connected with the working of this, or any other, gas undertaking. The Committee had resolved to consider the question referred to them—the working of the undertaking during the past five years—under the following heads: (1) Plant and distribution. (2) Quality of the gas. (3) Method of obtaining contracts for plant, goods, and materials. (4) Price charged for gas. They had determined also that, as far as was possible, the evidence taken at one time should be under one particular head of inquiry, and that one person should be examined upon only one subject; but the same person might be called upon to give evidence at more than one sitting. He might speak on one day as to plant, and on another as to price. They could not do better than commence with a sort of historical survey of the procedure of the Gas Committee during the last five years. Sir Samuel Johnson, the Town Clerk, was not in the best of health; but Mr. Harris, the Assistant Solicitor to the Corporation, was as conversant with the matter as was Sir Samuel. He had received no intimation from the three members of the Council who gave evidence at the last inquiry as to whether they were coming forward again.

Mr. *Frank B. Harris*, Assistant Solicitor to the Corporation, and Assistant Clerk to the Gas Committee, said that at the beginning of 1902, the Chairman was Alderman Ford, and the Vice-Chairman was Mr. Truman. On Nov. 11, 1904, Mr. Harlow was appointed Chairman, and continued in that position until June, 1906, when Mr. Ashworth acted as Chairman. Mr. W. R. Chester was the Gas Engineer at the beginning of 1902; and in January of that year he fell ill. Prior to his illness, he had not been officially commissioned to undertake private work. In January, 1902, he was so ill that he applied for leave of absence for two months. This period of leave had to be extended; and before the extension had expired he died. Mr. Brown was appointed on Sept. 11, 1902. On Sept. 8, just prior to the appointment, Alderman Radford had made some strong criticisms at a meeting of the City Council as to the condition of the undertaking and its management. On Oct. 6, the Committee brought up a report referring to these criticisms, and considerable discussion took place. As a result, Sir George Livesey was called in; and inquiry into the whole thing was begun. Mr. Brown did not come to Nottingham until a short time after. Sir George's report advocated a reduction in the candle power of the gas. On Feb. 23, 1903, other resolutions were passed on the subject, with the result that the Engineer was requested to report as to the difficulty of reducing the candle power of the gas and giving information to the consumers as to the type of gas burners and fittings most suitable for the incandescent system. In the reports of both Mr. Brown and Sir George Livesey it was emphasized that the fittings of the consumers should be looked after if the illuminating power were reduced. On July 9 there was a complaint of the prevalence of naphthalene; and instructions were given to the Engineer to make certain alterations, which were not to cost more than £1000. About that time, Mr. J. E. Moon was appointed Superintendent of the works at Eastcroft. The question of the maintenance of the fittings, &c., was from time to time before the Committee; and it was also decided to spend £1500 on certain machinery at Eastcroft. On Jan. 7, the Engineer made a long report on the distribution and the mains; and a report was also made with reference to the efficiency of the storage accommodation at Radford and Basford. Mr. Brown was asked to get tenders for increasing the storage accommodation; but nothing was done. On July 20, 1904, there was a minute headed "Naphthalene in the Gas," in which the inspector reported there had been a great deal of difficulty caused by the presence of naphthalene in the gas; and in a period of about two months over 2000 gas-lamps had been extinguished from this cause. The minutes referred to individual complaints; and it was resolved that something be done immediately to check the complaints. The Engineer recommended that a naphthalene "scrubber" be erected at Basford, at a cost of £500, which was done. On Sept. 15 there was a report from the Engineer on old service-pipes, which he said in many instances had become worn out, and in other cases were inadequate for the purpose; and this gave rise to many complaints of insufficient pressure. He reported also on difficulties of distribution at Beeston and Ruddington; and steps were taken with a view to remedy them. Witness mentioned that £6000 was spent on water-gas plant. There was no special minute of the Committee authorizing the erection of the carburetting arrangement. He believed the expenditure was included in the £18,000 for general extensions at the Basford works on May 1, 1905.

The MAYOR read out the various principal items of expenditure on improvements which made up the £18,000, but said there was no mention of a carburetted water-gas plant. He pointed out that there was a minute authorizing the erection of a water-gas plant to cost £2300, with a further £760 for building extensions; but the blue water-gas plant and the carburetting arrangement cost £6000, of the authorizing of which expenditure there was no minute. He asked Mr. Brown to throw some light upon the matter.

Mr. *J. H. Brown*, the Gas Engineer, explained that the plant had not been definitely ordered by the Committee; but the matter came on with respect to a special tender for the purchase of oil—a contract of a million gallons of American oil. The cost of the water-gas plant was included in the £18,000. The carburetter plant was decided upon later in the year; and the matter did not come officially before the Gas Committee. There was a minute authorizing the purchase of oil for the carburetter. If they accepted the purchase of the oil, they must of necessity accept the authorization of the plant. So far as his memory served him, the carburetted water-gas plant was on only one occasion discussed by the Committee. The reason the subject was brought up suddenly was because with the approach of winter they were in difficulties with regard to storage; and he believed they would be in a much better position if they erected a carburetter in addition to the water-gas apparatus. Mr. Harlow, the Chairman, he thought, gave the definite order for the plant.

The MAYOR said, with regard to various contracts, the Committee would like to know of any case in which the lowest tenders had not been accepted. This meant that if the officials had a list of tenders, the Committee would like to have them tabulated—he meant a list of the last five years' contracts for materials and for works.

Further examined, witness stated that when he took charge of the gas-works twenty retorts of the sixty at Basford were dangerous, and not fulfilling their purpose; some of the other forty were in a shocking condition; and the make of gas was ridiculously small in consequence of the bad state of repair and the old-fashioned plant in use. Some old beds of retorts were not being worked at all. With regard to the necessary repairs to the Basford works, he said that last year's repairs were neglected; and that the works, which had been brought up to a fair state of efficiency, were now in a worse condition. No reason had been given to him by the late Chairman for the necessary repairs not having been gone on with. He also spoke as to the antiquated nature of the Radford works. He said the Radford plant for treating the gas when it left the retort-house was not sufficient to deal satisfactorily with the gas made in No. 2 retort-house. The Eastcroft plant, on the other hand, was in very good condition indeed, having been recently reconstructed. He had reported to the Committee from time to time on the repairs and reconstruction work he considered necessary; but the Committee had not on all occasions carried out his views.

The MAYOR said he would be pleased if, at the next meeting, Mr. Brown would be ready to tell them what suggestions of his had not been carried out. He added: "If there is any defect in the concern, the responsibility is either yours for not advising the Committee, or the Committee's for not taking your advice."

In answer to further questions, witness said when he first came to Nottingham he was told by the Lighting Committee that it was impossible for them to adopt incandescent burners in the street-lamps, because of the great trouble they had with naphthalene. They said they had had to abandon them. His experimental water-gas plant was his first attempt at reducing the naphthalene; and the complaints had been reduced very considerably. He produced a table of statistics showing that the complaints in 1895 numbered 3700; in 1902, there were only 32; in 1903, there were 11, rising again in 1904 to 1074, in 1905 to 2262, and falling again in 1906 to 1416. In the meantime, the consumers had increased from 39,000 to 63,000; while the naphthalene complaints had fallen practically from 3700 to 1400. At first he had a good deal of difficulty with regard to distribution, which, however, had now been very largely overcome by altering the mains and the valves. The condition of the mains and the absence of maps and charts in some of the districts were serious difficulties; and he gave one instance which showed this very forcibly, in which a governor which had been supplying two districts could not supply one alone. The pressure practically disappeared; and the gas would have gone out, but for one of the officials noticing it. They found out afterwards that the gas for No. 1 district had not come from these works at all, but from another part altogether, by a way no one knew of. The advice he gave to the Committee as to distribution had been carried out; and he was now quite satisfied in this connection.

The Committee then adjourned till to-day (Tuesday).

BELFAST GAS PROFITS AND THE RATES.

At the Monthly Meeting of the Belfast City Council, Mr. J. A. Doran, in moving the adoption of the Gas Committee's minutes, made some reference to the grant promised in aid of the rates. It might not, he said, be generally known that from time to time they had given large sums out of their funds for the purpose of keeping down the rates, and that up to the end of the present financial year they had contributed a total of £180,690 towards this object. They had hoped these amounts would have made some reduction in the rates; but it seemed that the opposite was the case, as instead of being reduced they were increased. He did not know where all the money went to; there must be waste somewhere. The contribution they had promised for the coming year would amount to over £30,000, or an equivalent of 6d. in the pound on the rates; and in giving this large sum, the Committee were hampering themselves financially so that the rates might not be increased. He wished to warn the spending departments that it would be impossible for them to continue paying these large amounts away, for the very good reason that they would not have them to give. The prices of coal, oil, and other materials had increased considerably, and the price of gas had been reduced; so that they could not expect to have the large profits they had had in the past. He hoped, therefore, that a close watch would be kept on all the spending departments. He might add that the sum of £180,690 which he had referred to as having been contributed for various purposes included the dividends and sinking fund on stock issued for payment on the new City Hall, which they agreed to pay for ten years. Three years of this period were unexpired, so that up to the end of that time the ratepayers would not be called

upon to pay a single penny towards the cost of the building. These payments amounted at present to over £10,000 per annum.

In the course of the subsequent discussion, Alderman Byrne made the interesting suggestion that some of the gas profits might go towards the reduction of the price of electric light. On the other hand, Mr. Boyd very fairly argued that it was only justice that those who consumed the gas should receive benefit from the profits. Mr. Magee had always been opposed to these contributions by the Gas Committee to the rates; for he felt that the Committee should first satisfy the consumers that they were giving them value for their money. In January last, the Committee appropriated their profits in a certain way; but he thought they would have been wiser if they had placed a large amount to the reserve fund. The citizens were promised that when the revaluation came into operation, the rates of the city would be largely decreased; and they were reduced last year to the extent of some 5d. in the pound. But this year they were raised again by 3d. and 4d.; and they would be still higher were it not for the fact that they were receiving from the Gas Committee a sum equivalent to 5d. in the pound. He thought these grants were only an encouragement to the large spending Committees to continue their excessive expenditure; and instead of making such contributions, it was the duty of the Gas Committee to provide a substantial fund to deal with contingencies that might arise. In reply to this, Mr. Finnigan pointed out that the Gas Committee had actually a sum of £50,000 put by for depreciation. Mr. Magee asked where it was; and Mr. Doran answered that it would be very difficult to say where it was invested. He thought it was invested in the works, which was as good a security as they could get.

GAS EXTENSIONS AT WIGAN.

Objections to Water Gas.

At the Monthly Meeting of the Wigan County Borough Council last Wednesday, Alderman Holmes, in moving the confirmation of the minutes of the Gas Committee, said there were some matters of importance to consider. The Committee were proposing to apply to the Local Government Board for sanction to borrow £20,500 for the supply of meters, and for the extension of mains and services in connection with the undertaking. In 1904, sanction was obtained to borrow the sum of £25,332; and of this, £18,873 had been expended. They had overspent on mains and services £1648; and the amount unexpended for meters was £116. The Committee estimated that they would require over the next three years, including the amount overspent for mains and services, the sum of £10,000 for prepayment and ordinary meters, and £10,500 for new mains and services—making a total of £20,500. The Council would also perceive that the consumption of gas was hourly and daily increasing. Between April 1, 1906, to Feb. 15, 1907, the increase amounted to 12,241,000 cubic feet. This showed that it would be very necessary within a very short time to extend the works to meet the requirements that were being called for. One great cause of this was the fixing of slot-meters. They had now 6539 slot-meters and 12,655 ordinary meters fixed. This rendered it necessary that some further preparation should be made for the production of more gas, because during the winter season—and especially on days when thick fog hung about—the consumption of gas was much greater than at other times; and if this took place for two or three foggy days, there was no question that the supply of gas would run short, and the town and district would be plunged in darkness. Therefore, considering this matter, the Gas Engineer (Mr. J. Timmins) had advised the Committee to put down an installation of carburetted water-gas plant. This would enable them to produce 600,000 cubic feet of gas per day, and would cost only about one-half what an extension of the coal-gas plant would cost to produce the same quantity of gas. The working cost of the system would also be considerably less than that of coal gas.

The motion having been seconded, Mr. M'Quaid said he thought the Council should hesitate considerably before they placed in the hands of the Gas Committee power to initiate a system of carburetted water gas, which was most deadly. Seeing that Wigan had done without water gas for so long, it was rather late in the day to introduce it now. He should not give his consent to an installation of this description being put down, until he was perfectly assured that there was no possibility of any fatal accident happening through it. Mr. Belshaw said, after Mr. M'Quaid's explanation, he personally was prepared to give the matter further consideration. For the sake of £3000 or £4000, he would not subject the public to such a danger. Mr. Benson wished the Committee would take the matter back and consider it, and let the Council have something more on the subject than was then before them. In order to test the matter, he moved that this part of the minutes be referred back for further consideration. Mr. Fletcher seconded, and Alderman Ashton said he had no doubt the Chairman of the Gas Committee would take the matter back, if the members of the Council thought there was any danger with regard to the introduction of carburetted water gas. The Gas Engineer would hardly recommend them to adopt the system for emergencies without he was certain that he was recommending something that would not be dangerous to the lives of the people. At the same time they would not lose anything by the Committee taking it back, and discussing the matter from a health point of view. If they came forward again next month with the recommendation, they would adopt it.

In reply, Alderman Holmes said he thought the Council were taking too serious a view of the matter. In these times, when there were high rates, they must do something that would assist them in carrying on the work of the Corporation. The system they recommended was in use in something like 150 towns, and why should not Wigan adopt it? There would be a very great outcry if they were to run short of gas, and the town and district were left in darkness. Their only desire in recommending the system was to benefit the town. He did not want to take the minute back; but if it was the wish of the Council, he would do so.

The minutes of the Committee were then passed, with the exception of the part relating to the installation of the water-gas plant, which was referred back for re-consideration.

FALMOUTH CORPORATION AND THE GAS COMPANY.

Withdrawal of Opposition to the Company's Bill.

At the Meeting of the Falmouth Town Council last Thursday, the General Purposes Committee reported that they had conferred with the Directors of the Gas Company concerning their proposed Bill and the requirements of the Council, and the Directors had agreed to the loan capital not being converted into share capital; the rate of interest on the preference stock to be reduced from 6 to 5 per cent.; the standard price of gas to be lowered from 4s. 2d. to 4s., on condition that the model clause be inserted; and that no other residual product except sulphate of ammonia should be manufactured on the new land. The Directors stated that the clause as to the renewal fund was in the ordinary form, and therefore they could not agree to the fund being limited to one-twentieth instead of one-tenth of the paid-up capital. They could not agree to the repeal of their existing powers of manufacture over the 40 feet of the old land. As to water gas, there was no legal percentage prescribed in other cases, and therefore they could not agree to the limitation proposed by the Council. As the Company were liable for any damage caused by residual products flowing into the harbour, the Directors could not agree to the further penalties asked for. They denied that any payments on capital account had been charged to revenue account, as suggested. It was altogether impracticable to move the works, and they would not agree to any purchase clause being inserted. The Committee, having conferred with their Engineers and Parliamentary Agents, decided not to press the point as to a reduction in the renewal fund; that the reduction of 2d. in the standard price be accepted on the condition named; that the Council should not insist on the repeal of powers over the 40 feet of the old land; that no percentage of water gas be pressed for; that the restriction as to the manufacture of residual products be accepted; that the amendment as to penalties for bye-products flowing into the harbour be waived; and that the Council do not proceed further in their opposition to the Bill as regards the removal of the works. The Committee were divided in opinion as to the desirableness of insisting on the introduction of a purchase clause; but a majority was against further opposition to the Bill for the purpose of securing this concession.

The Council discussed the report at some length. Mr. Bullen urged that a purchase clause should be inserted, as the undertaking ought to be in the hands of the Corporation; but Mr. Williams said he voted against the purchase clause because their experts advised them that it could not be inserted unless they were prepared to move the works from their present situation. This would mean an expenditure of at least £20,000 in addition to that of purchasing, and would land the town in serious difficulties. Mr. Owen complained that too much of the business had been transacted in committee. They ought to have had a ratepayers' meeting to consider the advisability of purchasing the gas-works. Mr. Fox protested against the notion that a purchase clause was of any use unless they intended to buy the works. Mr. Cox contended that the negotiations could not have been carried on in public. No one could show that if the Council purchased the undertaking they could carry it on without aid from the rates. They were not justified in continuing the opposition for the sake of a few concessions which they might or might not obtain.

The report of the Committee was adopted.

PUBLIC LIGHTING AT DEVONPORT.

Victory of Gas.

A Special Meeting of the Devonport Town Council was held last Tuesday, to consider the question of lighting certain streets in the centre of the town. The Deputy-Mayor (Mr. E. Blackall) presided.

At present, Fore Street, the main thoroughfare, is lighted by electric arc lamps; and the question to be decided was whether certain neighbouring roads in which cables had been laid should be lighted by electricity or gas. The matter was considered by a Joint Committee appointed for the purpose. An estimate of the cost of lighting these streets with gas and electricity was submitted to the Special Committee. The Electrical Engineer (Mr. Spark) proposed that 40 flame arc lamps should be put up, and that the charge for these and for the existing arc lights should be £12 10s. per annum. Mr. J. W. Buckley, the Gas Engineer, submitted an estimate of the cost of lighting by gas, in which 64 lamps, with three incandescent burners in each, would be employed; the charge being £6 4s. 8d. per lamp. The cost for the 40 arc lamps would thus be £500 per annum, as against £399 for gas. The advocates of electric lighting, however, urged that the difference in the actual charge would be less than this, owing to the reduction in cost of the lighting of Fore Street from the present rate of £22 10s. to £12 10s. On the other hand, it was pointed out that if electric lighting were adopted the arrangement of the arc lamps would necessitate the retention of 12 of the present gas-lamps at a cost of £43 10s. per annum. The Joint Lighting Committee recommended the adoption of gas lighting; and the Surveyor's Committee, who have charge of the streets, endorsed the recommendation.

In moving that the minutes of the Committee and of the Gas Committee be confirmed, Alderman W. J. Waycott (the Chairman of the Surveyor's Committee) said it was something like three years since it was felt that the lighting of certain streets required attention; and the Special Committee were appointed to consider the question. From the beginning, the matter had resolved itself into a competition between the Electrical Committee on the one hand and the Gas Committee on the other. He felt in an exceedingly delicate position. Both the electricity and the gas works were the property of the Corporation; and it was not desirable to laud too highly one system of lighting at the expense of the other. Both mediums of lighting were excellent; and the adoption of one or the other was a matter of taste in very great measure. The Committee recommended the Council to adopt gas lighting. Some years ago electricity was thought more of than it was to-day; and there was an idea that it would supersede gas. Well, it had not done so either in Devonport or elsewhere. Gas had held its

own, and so far as they could see was likely to do so. The matter of cost was gone into as nearly as possible, but he did not think he need enter into this question. If they were to take the statement of the electrical authorities as to candle power, and put it against the statement of the gas authorities, with the prices submitted by each, undoubtedly electricity would have the advantage, and would appear to be the cheaper. This was not the view which the Committee had taken. They thought candle power was somewhat misleading, and that they could scarcely be guided by it. It resolved itself into a matter of satisfactory lighting. He asked them to put candle power out of their minds altogether, and to focus their attention on the fact that they wanted the leading thoroughfares well lighted, and in such a manner that people would praise them for it. They wanted to brighten up the town; and the Committee were convinced that the lighting which the Gas Committee proposed to give on the terms submitted would be perfectly satisfactory to all. The Gas Committee had had a good deal of up-hill work; and they had got a very nasty thing to face in the loss of a big customer in the Government. Gas had had a check by losing the business of supplying the Dockyard; and he thought it the duty of the Council to stand by the undertaking—seeing that gas was able to give them what they required.

In seconding the motion, Alderman Hornbrook said the Gas Committee were going on very well with the improvement of the public lighting; and they were paying for it out of revenue. In less than six months, every lamp would be changed from the old flat-flame to the incandescent system. There would not then be a better lighted town in England than Devonport. This recommendation was adopted by the Joint Lighting Committee by 6 votes to 3; it was confirmed by the Surveyor's Committee by 12 votes to 2; and at the meeting of the Gas Committee, there was not a dissentient voice. The Chairman of the Electrical Committee, who was at the meeting of the Gas Committee when the question came up, left before the vote—an indication of absolute surrender. Some years ago, electricity did seem to threaten to extinguish gas; but science had since unfolded some of her secrets, and in his opinion they had only just begun to tap the resources of incandescent lighting. The speaker then referred to the preference shown for high-pressure gas lighting in the City of London, and to the fact that the Liverpool Corporation (though owners of the electricity undertaking, while the gas-works belonged to a Company) had decided not to extend electric lighting in the streets. With regard to the price, he would be perfectly frank with the Council. They could not afford to give gas away until they had paid off their loans; and they accordingly charged a fair and proper price, and made a profit of 7d. per 1000 cubic feet. There were gas committees who supplied gas for street lighting at less than cost price—some did it for nothing. They, however, could not afford to supply Devonport on these terms now, though they might be able to do so by and by. The Electrical Committee had been a little unfair in not telling the Committee what profit they would make on the lighting, and they had also been unfair in another respect. The Committee offered to supply arc lamps for £12 10s. per annum. They could not do this and get a fair profit as they intended to do out of the gas. If the Electrical Committee charged according to their present price, the amount would be £684 per mile; but what they proposed to do was to bring it down to £218 per mile.

The Chairman of the Electric Committee (Mr. Banbury) said they were asked to believe that his Committee were quoting a losing price, while the Gas Committee were going to make a profit of 7d. per 1000 cubic feet. In Stonehouse, where gas was 1s. 9d. per 1000 cubic feet, the charge for lamps with double incandescent burners was £6 per annum, whereas in Devonport the Gas Committee were only going to charge £6 4s. 8d. for three-light incandescent lamps. This did not appear to tally altogether with the statement as to the profit to be made. He was opposed to the motion, not because he was biased in any way, but because he believed in the comfort and uplifting of the town, and adding to its importance. It was not the fact that the price of £12 10s. per arc lamp was an unknown rate. At Bradford and Chesterfield the charge was £12 10s., at Peterborough £12; and there were lower quotations, even down to £10 per lamp. He maintained that, taking all the figures into consideration, electricity would be cheaper than gas, while the candle power would be more than double.

Mr. Tarn complained that the electric lighting in Fore Street was inefficient, and said that if this was a sample of what the Electrical Committee could do, he was going to vote for gas. The real question was that of the efficiency of the lighting, not the candle power on paper. Mr. Bartlett said the Electrical Committee appeared to be offering current at about 1½d. per unit, whereas the cost was from 4d. to 4½d. per unit; and if this were so, somebody was suffering an injustice. The gas undertaking was burdened with a large amount of capital; and it would be extremely unwise for the Council to risk the possibility of delaying the redemption of the capital. Mr. Pole thought the arguments came to this—that gas lighting would cost £127 additional, and electric lighting about £98. He was quite persuaded that 60,000-candle power in electric light was far more efficient than 27,000 candles in gas. Mr. Coombs also was surprised to hear statements in favour of gas, and was convinced that they would make a mistake if they lit the streets by this means. He mentioned that electricity was cheaper than gas, and that the people in the thoroughfares they were considering had as much right to electric lighting as those living in Fore Street. Mr. Paul said that the competition of the Electrical Committee was not fair, for the charge was based on a figure at which it was not possible to produce the current profitably. Alderman Littleton remarked that the Gas Committee had certainly improved the lighting of the town generally, though they had not reduced the price of gas as it was anticipated they would. If they could get efficient lighting at a cheap rate, it was their duty to do so.

After several other members had spoken, a vote was taken, when the resolution in favour of gas lighting was carried by 32 votes to 9.

The Directors of Stewarts and Lloyds, Limited, have decided, after setting aside £70,000 for depreciation, to recommend the declaration of a dividend for the half year ended Dec. 31 at the rate of 11 per cent. per annum on the ordinary shares, the placing of £25,000 to the reserve fund, and carrying forward £61,000.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Slot Meters Help Profits at Dover.

At the half-yearly meeting of the Dover Gas Company on Monday last week, the Directors reported that, after making the usual allowance for the sinking fund and depreciation, and paying the full statutory dividend at the rate of 7½ per cent. per annum (less income-tax), there would be a surplus of £438. They explain that this would have been larger but for the falling off in the value of residuals and the expenses attending the repair of one of the holders. A satisfactory feature of the report was the statement that the prepayment meters proved a valuable mode of supplying gas, and a source of profit to the Company. The Chairman (Mr. Willsher Mannering), in moving the adoption of the report, said the figures in the accounts for the past half year were not quite so favourable as those for the corresponding period of 1905, owing to increased expenditure and slightly decreased receipts. Nevertheless, there was a net profit of £4000, of which the statutory dividend would absorb £3562; leaving a balance of £438. The Chairman compared in detail the various items, and went on to say that during the half year the number of prepayment consumers had increased by 90; the total number at the end of the year being 3611. The quantity of gas supplied through the meters was 27,258,200 cubic feet, or equal to 24·4 per cent. of the total sales. An analysis of the working during 1906 showed that 22,870 tons of coal were carbonized and the quantity of gas sold was 233,334,100 cubic feet. The total number of consumers at the end of the year was 6365; and the number of cooking-stoves and heaters on hire was 5184. The financial result was a surplus of £1063, after providing for the full parliamentary dividends. He was pleased to add that the staff continued to discharge their duties with care and efficiency; and the officers and men worked harmoniously together. They took a good deal of interest in the affairs of the Company; and he believed they did what they could to promote its prosperity. Mr. Bottle seconded the motion, and it was carried unanimously. Replying to a vote of thanks to himself and the Directors, the Chairman proposed a similar recognition of the services of the Secretary (Mr. G. Fielding) and the Resident Engineer (Mr. R. Herring), whose acknowledgment of the compliment brought the proceedings to a close.

Growth of Gas Supply at Enfield.

At the recent half-yearly meeting of the Enfield Gas Company, the Chairman (Sir Alfred Somerset, K.C.B.), in moving the adoption of the report, in which a dividend at the rate of 5½ per cent. per annum on the consolidated ordinary stock was recommended, directed attention to the evidence afforded by the accounts submitted that the Company's business had grown at a considerable rate during the six months ending Dec. 31. He said that those who knew Enfield, the affairs of the Company, and the condition of the gas industry generally, twenty or five-and-twenty years ago, were aware that they were greatly changed—whether for the better was a matter of opinion; but that great strides had been made in the prosperity of the Company and in gas matters all over the country and throughout the world, no one could gainsay. The great advance made in all appliances for using gas, whether for lighting, cooking, power, or heating purposes, were steps on the way to the achievement of still better, more efficient, and more economical results. Never before had there been so many highly trained scientists engaged in the gas industry; and, under such circumstances, it would be rash to say that the high-water mark was reached with the discovery of the incandescent mantle. Mr. Alfred Ford, in seconding the motion, mentioned that the quantity of gas sold during the half year exceeded by more than 9 million cubic feet—or 11·22 per cent.—that sold in the corresponding period of 1905. The total number of consumers was 7161, and there were 5218 cookers in use. The report was unanimously adopted. In the course of the subsequent proceedings, the General Manager and Secretary (Mr. C. W. Offord) expressed his thanks for the increased remuneration which had been unanimously voted to him; and the Engineer (Mr. W. A. Valon), in acknowledging a vote of thanks to the staff, took the opportunity of pointing out to the shareholders that a very favourite plan adopted by some careless advocates of electricity was to compare the best form of electric lighting with the worst form of gas lighting, in order to bolster up a misstatement. But the truth remained that, comparing the best form of electricity with the best form of using gas for lighting purposes, the difference in cost was in Enfield many times more. There was, no doubt, a field for electricity. Well, let the electricians occupy it. Certainly public lighting was not that field.

Extensions and Reduced Price at Farnham.

At the annual general meeting of the Farnham Gas Company, Limited, the Chairman (Mr. A. J. Nash) submitted a most satisfactory report and balance-sheet for the twelve months ending the 31st of December last. The former showed that during the year new boilers, condensing plant, and station meter had been supplied, and the washing and scrubbing appliances enlarged, at the works—amounts equivalent in value to the old apparatus displaced being charged to the revenue account; and it was intimated that practically the whole works had now been modernized, and were in a high state of efficiency. During the twelve months, 4569 tons of coal had been carbonized, producing 52,133,000 cubic feet of gas, or a yield of 11,410 cubic feet per ton. The coke and breeze actually saleable was 10·3 cwt. per ton of coal. The report was adopted, full dividends were declared, and it was decided to reduce the price of gas to 3s. 4d. per 1000 cubic feet as from the 1st of January last. The Engineer and Secretary (Mr. S. J. Symonds) was congratulated upon the results obtained, and recognition of his services was suitably made.

Improved Working at Hastings.

In the report presented by the Directors of the Hastings and St. Leonards Gas Company at the extraordinary general meeting last Thursday, they stated that the development of the new works at Glyne Gap, which have been described in our columns, was proceeding satisfactorily; and it was hoped that the whole of the manufacturing operations would be transferred there during the present half year. After

some reference to the result of the arbitration proceedings between the Company and the Tramways Company in regard to the mains along the Front, which has already been recorded, the Directors state that the accounts for the six months ended Dec. 31 last showed a profit balance of £12,244; and they proposed to pay the statutory sliding-scale dividends (less income-tax)—viz., £6 10s. per cent. per annum on the 5 per cent. converted stock; £5 per cent. per annum on the 3½ per cent. converted stock; and £6 1s. per cent. per annum on the 5 per cent. additional stock—and carry forward the balance. In moving the adoption of the report, the Chairman (Dr. G. G. Gray, J.P.) said the value of the gas sold in the six months covered by it showed a decrease of £1476, compared with the corresponding period of 1905; but he reminded the proprietors that in the past half year the price of gas was 1½d. per 1000 cubic feet less than in the latter half of the previous year. Of the £1476, they had already recovered £1300 The total decrease in revenue was £1525. On the other hand, there had been increases of £389 from meters and stoves, and £1555 from residuals (£1314 being for coke, due to the economy in fuel effected by the improved methods adopted at the new works); the total increase being £1952. There was consequently a net increase of £427 in the revenue, the total of which was £44,730. Dr. Gray next reviewed the expenditure side of the revenue account. He said the outlay on coal, tar, &c., showed a decrease of £221, which was the result of not having to pay the coal-duty. But against this they had the £1476 decrease in the value of the gas sold. Under the head of purifying, a saving of £82 had been effected; wages showed a drop of £544, due to the improved method of manufacture at the new works, which was exceedingly satisfactory; and rates were £34 less, owing to the reduction in the poundage. The report was adopted.

Prosperity at Holmfirth.

For the first time in the seventy years' history of the Holmfirth Gaslight Company, a dividend of 10 per cent. per annum was declared at the recent annual meeting of shareholders. During the past four years, the sum of £2500 has been expended out of revenue on bringing the works up to date; while a similar sum has been spent in a like manner in adding 500 consumers to the books. The Chairman and several of the Directors spoke of the untiring energy displayed in the management by the Engineer and Secretary (Mr. A. E. Buckley).

Advance at Ilfracombe.

It is gratifying to learn that the enterprise of the Ilfracombe Gas Company in removing the works from the centre of the town to a new site in the suburbs, has been justified by results. The report presented to the shareholders at the annual meeting last Wednesday, was one of satisfactory progress, in which the results obtained in recent years were referred to as having fully realized the expectations formed when the capital expenditure was undertaken. At the end of last year, there were 2282 customers on the books, an increase of 91 during the twelve months; while the cooking-stoves on hire have reached a total of 754, an increase of 61. The village of Coombe Martin, to which the mains were recently extended, now has 213 meters and 96 cookers; and the Chairman (Mr. R. Lake) spoke of it as bidding fair to be a valuable asset of the Company. The accounts showed an available balance of £3954; and the statutory dividends of 5 per cent. on the preference and ordinary stocks were declared. The Chairman referred to the economy which had characterized the expenditure, and as to the income remarked that, while the ordinary sale of gas increased, the quantity used for the public lamps was less owing to the number of lighting hours being reduced. With regard to the price of coal, he said the Company were in the satisfactory position of having made good contracts till Michaelmas next. In the course of the discussion, some of the shareholders suggested that the price of gas should be reduced; and an undertaking was given that the matter should receive attention as soon as the condition of affairs justified it. Mr. Lake was re-elected a Director; and a special tribute was paid to the interest he had for many years shown in the Company. Mr. W. Ball, the Secretary, Mr. Armstrong, the Manager, and the other officials were heartily thanked for their services.

Keeping Abreast of the Times at Redhill.

The Directors of the Redhill Gas Company recently presented to the proprietors the 47th annual report and accounts, which showed that the working in the past year had produced a profit on the revenue account of £7632, and that a sum of £8954 was available for distribution. They recommended the declaration of a dividend of 10 per cent. on the share capital, and of 5 per cent. on the "B" stock, which would leave a balance of £1710 to be carried forward. The Chairman (Mr. G. R. Hunt), in moving the adoption of the report, said the period covered by it had been a busy one in connection with the renewal and extension of the mains and works. The retort-house about to be erected on the occasion of the last meeting was nearly finished. It was 87 feet long and 63 feet wide, and contained a retort-bench of six arches, three of which were already filled with beds of 14 retorts each, making a total of 42 new retorts. They had put down four new purifiers of improved construction, erected a new washer-scrubber, with engine, and laid four miles of mains to South Nutfield. He thought, if the proprietors looked round the works, they would agree with him that much improvement had been effected in them during the past five years. Their Engineer and General Manager (Mr. James Paterson, M.A.) reported that with their present plant they were in a position to meet any demand that might be made. They were now taking gas to a new district—Walton-on-the-Hill—from which they had received many applications from inhabitants to be supplied with gas. The prepayment meter business was rapidly increasing in importance in their accounts. The Company supplied both penny and shilling in the slot meters, the latter being chiefly used in the better class of house, or by small shopkeepers. The cooking-stoves, which were always supplied with these meters, had also increased in popularity of late years; and the Directors were now making special arrangements for the supply of gas for engines, and they had no fear as to retaining the custom they had hitherto received from consumers in this respect. The report was adopted. Replying to a vote of thanks to the Chairman, Directors, and officials, the Chairman assured the proprietors that they would do all they could to promote the prosperity of the Company. With regard to the officials, they had in Mr. Paterson a very competent Engineer, and one who was always trying to save the expenses of the Company as much as possible. With regard to Mr. Long (the Secretary) he had been with the Company a number of years, his heart was in his duties, and the whole staff worked very amicably together. Mr. Paterson acknowledged the compliment on behalf of the staff. In regard to the works, he pointed out that the time always came, with a progressive gas company, when even half-a-dozen extra retorts would require a new house to put them in—that was to say, one required to make a new house to get a small amount of extra retort power. They now had the house, and from time to time they would be able to increase their manufacturing capacity by putting in extra retorts at small expense as the progress of the district required.

Cheaper Purification and More "Slots" at Richmond.

In moving the adoption of the report at the recent half-yearly meeting of the Richmond Gas Company, the Chairman (Mr. T. J. Carless) remarked that £800 had been spent at the works on a further installation of retorts on the regenerative system. With regard to the expenditure on revenue account, he mentioned that coal had cost somewhat less, owing principally to the smaller quantity used and the excellent carbonizing returns; the gas sold per ton of coal used being in excess of the corresponding period last year. Purification showed a satisfactory reduction in cost, owing solely to abandoning the use of lime, which had benefited alike the people in the neighbourhood of the works and the men employed in changing the purifiers. The sum receivable for gas had been slightly affected by the mild and bright weather of the autumn and by the growing use of the incandescent burner, but he was satisfied that the business of the Company was as sound as ever. The prepayment system had largely increased during the half year; the returns of gas sold under this head being 11½ per cent. in advance of the figures for the corresponding period of 1905. The report was adopted, and a dividend at the rate of 5¼ per cent. per annum for the half year was declared. The proceedings closed with votes of thanks to the Directors, Mr. Thomas May, and staff.

Another Increase at Southend.

The report for the half year to Dec. 31 which was adopted at the annual meeting of the Southend Gas Company last Tuesday stated that the increased sale of gas over the corresponding period of the previous year was 14,178,900 cubic feet, equal to 10·89 per cent. The number of consumers on Dec. 31 was 9726 (of which 6261 were automatic), being an increase for the half year of 265. The profit and loss account showed a net amount available for dividend of £9398 (after writing £1500 off automatic meter house-fittings account, and placing £750 to the credit of the reserve fund account); and it was recommended that dividends be paid on the original and new ordinary stocks at the rate of 5¾ per cent. per annum, and on the new ordinary "B" stock at the rate of 5⅜ per cent., less income-tax. This amounted to £5618, and left £3780 to be carried forward to the next account. During the half year the Rochfort Union had re-assessed the Company's works and distributing plant at a figure which the Directors felt they could not accept. Notice of objection had therefore been served; but it was hoped that a compromise might be arrived at, thus avoiding an appeal to Quarter Sessions. The report of the Engineer and Manager (Mr. Francis Clark) showed that 1 mile 546 yards of new main-pipes had been laid, making a total of 55 miles 692 yards. In addition to this, 421 new cookers had been fixed, 680 houses supplied with automatic fittings, and 669 cookers repaired in the Company's workshops. The Chairman (Mr. C. F. Woosnam) said that, although over 14 million cubic feet more gas had been made, the manufacturing charges were less. Coal had cost them more; and he regretted that they had been obliged to make the new contracts at a considerable further advance. He was afraid they would have some difficulty in giving such a good balance-sheet next half year; but they hoped, by very careful working, to have the same dividend, and to keep down the price of gas. The make of gas per ton of coal, he mentioned, was 11,404 cubic feet; and the unaccounted-for gas was 4·61 per cent.

Burden of Rates at Stretford.

The accounts presented at the half-yearly meeting of the Stretford Gas Company, on Monday last week, showed a profit of £5775 for the six months ending the 31st of December. Adding £2116 brought forward, the amount available for distribution was £7891. The Chairman (Mr. W. Lewis Galloway), after commenting upon the satisfactory balance-sheet and the efficient and up-to-date condition of the works (which are under the supervision of Mr. H. Kendrick), proposed the declaration of dividends at the rates of 10, 7½, 7, and 5 per cent. per annum on the several classes of shares. After the payment of these, there would be left, he said, a balance of £2981 to be carried forward. The motion was duly seconded by the Deputy-Chairman (Mr. W. A. Nicholls), who, in the course of his remarks, which were directed mainly to the refutation of attacks which had been made upon the Company in a local paper, referred to the subject of rating. He said the incidence of taxation was a matter requiring attention. It pressed hard on gas consumers, for the works and plant were heavily rated, and so much more was taken out of the pockets of the consumers to keep down the rates of those who did not burn gas. There seemed to be a great want of system in the fixing of the rateable value; and during the past decade the amounts paid to the various rating authorities had gone up out of all proportion to the value of the property. In 1896, the Company sold 184 million cubic feet of gas, and paid £1356 in rates and taxes. In 1906, the sales were 325 millions, and the amount paid was £3186. The cost per 1000 cubic feet of gas sold being in the former year 1¾d., and in the latter one 2½d., a direct burden was put upon the poorer classes and those least able to bear it. If these charges could be reduced to something like reasonable figures, it would mean cheaper gas; and cheaper gas meant less smoke and a cleaner atmosphere, as very much more would be used for heating and cooking, and the Millennium of gas makers and local authorities alike would be in sight. To put the charge in another form, the Company paid in rates, &c., 6s. 5¾d. in the pound on their dividends, while the Government tax was only 1s. in the pound. A great many people besides themselves were of opinion that the gas industry was taxed far more than it ought to be, while others, started for a similar purpose, were charged far less. The motion was carried.

General Increase at Swindon.

At the recent annual meeting of the Swindon United Gas Company, the Directors reported steady progress in the sales of gas, which had increased by about 5 per cent., notwithstanding the competition of the electric light. The balance of the profit and loss account admitted of the usual dividends being paid. The Chairman (Mr. W. H. Ludgate), in moving the adoption of the report, stated that during the past year the consumption of gas had been as follows: Ordinary meters, 71,070,200 cubic feet; slot meters, 69,546,300 cubic feet; and public lighting, 9,050,600 cubic feet—making a total of 149,666,100 cubic feet, or 6,378,800 cubic feet more than the consumption in 1905. The increase was to be found in all departments, but more particularly in the slot meters. The money value was: Gas for ordinary purposes and public lighting, £14,011; consumption through slot meters, £12,240—total, £26,251, or an increase of £1406. The consumers now numbered, 8706; being an increase of 466, the majority of them being users of slot meters. In fact, there were three of these consumers to one ordinary one. The total receipts amounted to £35,677, and the expenditure to £26,833. The net balance was £7844, or an increase of £344. An interim dividend had been paid, and there was a sum of £3440 available for distribution. The Directors had decided to recommend the payment of dividends at the usual rate of 5 per cent.; but on this occasion it would be free of income-tax. This would absorb £3141, and leave a balance of £299. The report was adopted.

Low Price, Good Business, and More Capital at Watford.

At the recent half-yearly meeting of the Watford Gas Company, the Directors reported that the profit on the working in the six months ending Dec. 31 last amounted to £3338, and that a sum of £6596 was available for distribution. They recommended the declaration of dividends at the rates of 7⅛ and 5⅝ per cent. per annum on the "A" and "B" stocks respectively, less income-tax. They drew the proprietors' attention to the fact that, notwithstanding the reduction in the price of gas, they had been able, largely through the increased demand, to recommend the payment of dividends on the converted stocks equivalent to those paid on the old stocks for the past three half years. In moving the adoption of the report, the Chairman (Mr. E. J. Slinn) pointed out that by reducing the price of gas 2d. per 1000 cubic feet they had saved the consumers £850. The price at which they now sold gas was lower than in any place in Hertfordshire, where it varied from 5s. 10d. to 2s. 8d.—Watford's price. In Middlesex, the highest price was 3s. 9d. and the lowest 2s. 8d. What was more remarkable, in the Midlands, where the coalfields were, the price ranged from 3s. 6d. down to 2s. 8d. He, therefore, thought their record for cheap gas was extremely good, and he pointed to the very careful work of all connected with their establishment, who got the best possible results out of their coal, and managed the whole concern in the most economical manner. The interests of the shareholders and consumers were certainly identical. With regard to the rates, 5 per cent. of the 2s. 8d. consumers paid for each 1000 cubic feet of gas went for rates. He did not know whether any other business had to pay as much as this. The report was adopted. At the close of the ordinary business, a special meeting was held at which the Directors were authorized to raise additional capital not exceeding £25,000.

Water.

Increased Revenue and Good Prospects at Bristol.

In the report which the Directors of the Bristol Water Company presented at the recent annual general meeting, they stated that the revenue from water-rates for the past year was £150,732; being an increase of £1780 on that of the previous year. The net sum shown by the revenue account (including £3298 brought forward) to be applicable for dividend on the ordinary capital was £66,876. Out of it the Directors paid an intermediate dividend at the rate of 7½ per cent. per annum on the ordinary shares and 5¼ per cent. per annum on the 7 per cent. maximum consolidated ordinary stock; leaving a balance of £36,389 for distribution. The Directors recommended the payment of final dividends at the respective rates of 8 and 5⅝ per cent. per annum; leaving a balance of £3427 to be carried forward. Owing to the accidental bursting of one of the large mains of the Company in Redcliff Street, very heavy claims for damages to goods and premises were made upon the Company; and a test action was brought by a local firm and tried at the Bristol Assizes in July.* The hearing resulted in a verdict in the Company's favour. The capital expended during the year was £31,688. In moving the adoption of the report, the Chairman (Mr. H. N. Abbot) said that though the increase in the amount of water-rates for the past year was less than for 1905, owing to the slump in the building trade and the large number of void houses, they looked for improvement this year. The Company were in a very strong position as regarded the quantity of water at their command; indeed, they could supply double the amount at present consumed, although last year their consumption had gone up about 250,000 gallons a day. They now supplied something like 9½ million gallons daily to the city; but with the springs at their disposal they were equal to a demand of 17 millions. From this the shareholders would see that the Company were well ahead of present requirements; and with the natural growth of the city they might look forward to bringing back the dividend to the time-honoured 10 per cent. Dealing with the bursting of the main in Redcliff Street, he said the Company were bound to defend themselves against the action brought, because a great principle was involved; and as they had some 400 miles of mains, it was absolutely necessary to meet the case. Though they had won the action, the costs, beyond those they received from the other side, amounted to £1980; but they had successfully reasserted a principle of the utmost importance, and he thought the shareholders would agree that, under the circumstances, the money had been well spent. The Directors felt they should voice the shareholders' thanks to the officers of the Company—to Mr. Alexander (the Secretary) first and foremost; to their excellent Engineer (Mr. J. A. MacPherson, M Inst.C.E.), who grew so much on acquaintance; to Mr. Gerrish, their able legal adviser, who had assisted them so much to weather last year's storm; and, finally, to all the other officers, clerks, and staff, on whom they depended so much. The report was adopted. At the close of the ordinary proceedings, a special meeting was held at which the shareholders sanctioned the issue of £9552 of 3½ per cent. debentures, part of the sum of £70,000 authorized by the Act of 1902.

* See "JOURNAL," Vol. XCV., p. 250.

Higher Expenditure and Increased Rates in South Staffordshire.

The report presented at the 108th half-yearly meeting of the South Staffordshire Water Company, recently held in Birmingham, under the presidency of Mr. Frank James, showed that the number of houses laid on in the six months ending the 31st of December last was 1513; making the total supplied 131,057. The gross amount of water-rates was £70,307, against £67,121 in the corresponding period of the previous year. The Directors transferred £2000 to the depreciation fund, raising it to £24,001. After providing for interest on the debenture and preference stock, the amount remaining for distribution (including £6469 brought forward) was £29,360; and the Directors recommended the declaration of a dividend for the half year on the ordinary stock at the rate of 7 per cent. per annum, less income-tax. The amount of the dividend being £22,111, there remained £7249 to the credit of the current half year. In moving the adoption of the report, the Chairman, turning to the profit and loss account, remarked that on the debit side, with a single exception, all the charges were in excess of the corresponding ones for 1905. Engine charges were higher on account of the greater consumption of coal at the pumping-stations. Wages and other things were higher; but many million gallons more water had been pumped. The maintenance account was larger by £1020; and rates—his old friend, about which he was tired of talking—showed an increase of £213. When they would stop growing he did not know. There was, however, one bright spot on the debit side; the law expenses and charges were less by £516. Water-rates were £3186 in excess of those at the corresponding period of 1905; and the net increase was £444. He concluded by asking the shareholders to confirm the recommendation as to the payment of a dividend at the rate of 7 per cent. per annum, at a cost of £544 more. Alderman Beale seconded the motion; and it was carried.

Five Years' Progress at Woking.

At the half-yearly general meeting of the Woking Water and Gas Company on Monday last week, the Directors reported that the balance at the credit of the profit and loss account was £4506, out of which they recommended the payment of a dividend at the rate of 4½ per cent. per annum for the six months ending Dec. 31 last, less income tax, which would absorb £3596, and also that £150 should be written off the suspense account—leaving £760 to be carried forward. In moving the adoption of the report, the Chairman (Sir John Baker, M.P.) said the result of the six months' working was a profit of £4888, against £4598 for the corresponding period of 1905—an increase of £290. The revenue from water-rental was £7794, compared with £7119; showing the very satisfactory rise of £675. The expenditure on revenue account amounted to £3164, against £2834, mainly in consequence of repairs to works and increased assessments. A return of the new consumers obtained during the past five years showed that the Company were on the road to increased prosperity. In 1902 there were 392 new house supplies and 40 new meter supplies; in 1903 the figures were respectively 421 and 43; in 1904 they were 530 and 56; in 1905 they were 408 and 50; in 1906 they were 336 and 53. The net water-rental had risen in the five years from £10,859 to £15,237—a total of £4378, or a yearly average increase of £875. If they could continue at the rate of about £1000 a year, he thought they ought to be well satisfied. It would encourage the Directors to again increase the dividend, and probably, after a short interval, to give the shareholders 5 instead of 4½ per cent. Mr. Baynes seconded the motion. Mr. Pain said he should have liked to hear something with regard to the purchase by the Guildford Corporation of part of the Company's undertaking. Was the money to be applied in reduction of the capital value in shares or debentures? The Chairman said he had omitted mention of this matter advisedly, because the Arbitrator (Sir John Wolfe-Barry, K.C.B.) was still sitting. He might say that the revenue derived from the portion of the undertaking they were parting with was about one-ninth of the whole. At the request of the Chairman, the Secretary (Mr. B. Dennett Holroyd) read the clause in the Act of 1899 providing that the money received from the sale should be employed for the capital purposes of the undertaking. The motion was carried unanimously.

CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Tuesday afternoon last, at the Offices, No. 11, Ironmonger Lane, E.C.—Mr. FREDERIC WILLIAM BLUNT in the chair.

The SECRETARY (Mr. W. B. Peat) read the notice convening the meeting; and the Directors' report and the accounts were taken as read. The report stated that the income on revenue account for the past year amounted to £29,436, and the expenditure (including £200 to sinking fund) to £14,506—leaving a net profit available for distribution of £14,930. The total amount available, including the balance of £5265 brought forward from the previous year, was £20,195. Out of this an interim dividend at the rate of 6 per cent. per annum was paid for the half year to June 30; and the Directors recommended the declaration of one at the rate of 8 per cent. per annum for the last six months, making 7 per cent. for the year. They also recommended that a bonus of 5s. per share be paid. These payments would absorb £12,375; and after crediting £1000 to the reserve fund, there would be a balance of £6820 to be carried forward. The income for the year showed an increase of £1389; while the expenditure was £1048 more. The unaccounted-for gas averaged 5·2 per cent. of the make over the whole year. The Directors were much gratified with the work that had recently been carried out for increasing the supply of water to the city and the villages by cleaning the main. The result had been most satisfactory. The concession for the supply of gas would terminate in another year; but negotiations were proceeding with the authorities as to a renewal.

The CHAIRMAN said his first duty was to express the Board's great regret at the absence of the Chairman of the Company (Sir John Aird). He was unwell; and he (the speaker) was afraid that his illness had been a little bit aggravated by the shock of another loss that the Company had sustained. It might be in the knowledge of those present that Sir Frederick Wigan, who had been a Director of the Company from its very commencement, died suddenly in London on the previous Saturday. He should like to say that Sir Frederick was a gentleman whom any Board might be proud to number among their members. He was a man of broad and liberal views, combined with excellent business judgment. He was a loyal colleague; and he never hesitated to use his considerable money power in support of a policy for which his financial strength was necessary. Turning from these regrettable subjects to the report and accounts, there was very little that need be said. The accounts for the past year were satisfactory. The receipts both for gas and water showed a small increase; and the representatives of the Company in Cagliari appeared to have given every satisfaction to the city authorities during the year with regard to the manner in which they had conducted the Company's business. They had also had the great advantage again of the assistance of their good friend Mr. Simmelkjör—who, by the way, he might say, had completed his fortieth year with the Company since the last meeting. The dividend proposed was at the same rate as it had been for the past three years. The increase in the supply of gas would have been greater if the urgent works which were required for augmenting the make and the storage had been carried out; and the Directors were anxious, from this point of view, that an arrangement with the authorities about the extension of the concession should be come to definitely. The shareholders would understand that it was impossible to incur any serious outlay while the negotiations, and the uncertainty they involved, existed; but if these negotiations were carried successfully through, certain works would be put in hand that would ensure a better supply of gas to the inhabi ants of the city. As regarded the water department, arrangements were made during the past year for scraping the leading main down from the reservoir to the city. He was a little sorry the expression "cleaning" found its way into the report, in case it should convey to anyone the impression that there was foulness in the main. What was scraped off was really a metallic incrustation, which naturally retarded and diminished the supply. The operation was carried out most carefully, and with very beneficial results; for the increase in the delivery of water to the city and villages in consequence of it was no less than about 50 per cent. It was also satisfactory to think the work was completed without any accident or delay in delivery of water to the city, although it involved dividing the main up for the time being into sections. A portion of the expenditure on this work—£703—would be found debited to the maintenance of water-works account; and this, he thought he was safe in saying, was more than half the total cost. The reservoir, mains, and filter-beds were in good order; and the supply to the villages during the past year had increased. There was also an increase of perhaps a rather remarkable amount in the "sundry work and sales of material" item, which was £224 for the previous year, and this year was £625. This was, the Board understood, to some extent due to a large number of new buildings having been erected during the past twelve months, so that there was a good deal of work in the way of fitting to do in connection with them. He concluded by moving the adoption of the report and accounts.

Mr. W. R. GALBRAITH seconded the motion; and it was carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. G. BURNEY, the interim dividend at the rate of 6 per cent. per annum which was paid last July was confirmed, and a dividend at the rate of 8 per cent. per annum for the half year to Dec. 31 was declared, together with a bonus of 5s. per share, less income-tax.

The CHAIRMAN proposed, and Mr. S. SIMMELKJÖR seconded, the re-election of the retiring Directors (Mr. John Aird and Mr. W. R. Galbraith); and this was carried.

The CHAIRMAN said he should like to propose that the thanks of the meeting be accorded to Mr. Sanna, in Cagliari, and his staff, for their efficient conduct of the business of the Company. The Board had had no reason during the year to alter their opinion as to the extremely satisfactory manner in which Mr. Sanna superintended the Company's work, or the way in which he controlled those under him, and induced them to do the same.

Mr. SIMMELKJÖR remarked that, knowing personally all the members of the staff, he had great pleasure in seconding the motion; and it was agreed to.

The Auditors (Messrs. Turquand, Youngs, and Co., and Mr. R. S. Robb) were re-appointed; and a vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, in acknowledging the compliment, said it had been a sad meeting, and the shareholders had done the Directors a kindness in not attending in larger numbers.

HARROW AND STANMORE GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday last week at the Albion Tavern, Aldersgate Street, E.C.—Mr. A. H. BAYNES in the chair.

The notice of meeting having been read by the ENGINEER and SECRETARY (Mr. J. L. Chapman), the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN said he hoped the proprietors had all read the report, because he thought the feeling would be that it was a very satisfactory one, announcing as it did continued success. He believed that the few figures he proposed to give would deepen this impression. The gas-rental for the half year had been £13,182—an increase of £1031 upon the corresponding period of 1905. The total quantity of gas sold during the half year was 68,622,000 cubic feet—an increase of 7,706,000 cubic feet, or 12½ per cent. The price of gas over the whole of the half year had been reduced by 1d. in the central area, and by 3d. in the outer area. Had these reductions not been made, the increase in the gas receipts would have been £1492, instead of £1003—a difference of £461. To-day, the price of gas for private consumers in the central area was 3d., and in the outer area 5d., less than it was at the end of 1905; and there had also been a corresponding reduction in the charge for public lighting. The quantity of gas made in the half year was 77,060,000 cubic feet, of which 50,073,000 cubic feet was coal gas, and 26,987,000 cubic feet carburetted water gas. The quantity of coal carbonized was 4626 tons; and the average yield was 10,824 cubic feet per ton. The receipts for coke and residuals amounted to £1959—an increase of £495 (after allowing £358 for coke used on the works for the manufacture of carburetted water gas), or an increase in the receipts of 33¾ per cent. The meter, fittings, and stove rentals amounted to £1180—an increase of more than 14½ per cent. Tar receipts had increased by 26 per cent., and sulphate receipts by 25 per cent. The total increase in the receipts had been £1633. Turning to the expenditure, it showed an increase of £1385 on the corresponding period of 1905, which was accounted for in this way: 688 tons more coal had been carbonized, costing £658; carbonizing wages had increased by £85; repairs to works, by £264; repairs to meters and stoves, by £207; and rates and taxes, by £115. Very considerable amounts had been written off stoves and meters for depreciation. The total profit for the half year was £4926—an increase of £248. The interest on debentures and loans required £565, and to pay the dividends recommended, there would be needed £4265; so that there would still be a small balance to carry to the amount brought forward. During the half year, they had added 336 new services for ordinary meters, and 536 for coin meters. The total number of ordinary consumers at present was 2668; and the number of coin meters fixed was 2475—together a total of 5143. During the half year, 8837 yards of mains had been laid, chiefly for new supplies, and some to replace smaller mains, which had been disconnected and written off in the item of repairs. He thought they would gather from this that, in nearly all the main features of the report, progress was shown. They were able from the earnings of the half year to pay the statutory dividend; and he did feel, considering all the circumstances, that they had good reason to congratulate themselves upon the present condition of the concern. He then formally moved the adoption of the report and accounts.

Dr. J. W. LEE GLAISHER seconded the motion, which was unanimously carried.

Moved by the CHAIRMAN, and seconded by Mr. HORACE J. RYDON, dividends were declared at the rates of 10 per cent. per annum on the original "A" capital, and 7 per cent. on the additional "B" and "C" capital and guaranteed shares, all less income-tax.

On the proposition of Dr. GLAISHER, seconded by Mr. RYDON, the Chairman was unanimously re-elected to his seat at the Board; and on the motion of Mr. F. LENNARD, seconded by Mr. SAMUEL CUTLER, the retiring Auditor (Mr. James Randall) was re-appointed.

In the course of his acknowledgment, Mr. RANDALL remarked that the balance-sheet was a record one; and he was sure the Company were only on the fringe of prosperity. They had a wide field; and Mr. Chapman would do his best to develop it.

The CHAIRMAN proposed a vote of thanks to the Engineer and Secretary. He said a great proportion of the progress of the Company was due to Mr. Chapman. He had displayed great ability in managing the Company's affairs; and his enthusiasm for work was unbounded.

Mr. F. J. SMITH seconded the motion, and it was agreed to.

Mr. CHAPMAN said, in responding for himself, he liked to feel he was also responding for his staff. He had a most faithful set of men about him, who took a great interest in the works and the Company's affairs generally. He was also pleased to say that some of the workmen had been with the Company for over thirty years; and this spoke well for those who had charge of the men and for the relationships between men and management. It would be seen from the report that their working was very excellent. In respect of fuel consumption and carbonizing wages, he did not think they were far behind companies very much larger in size. He was pleased indeed that the Company had been able to help the consumers; and also that the consumers had helped the Company. The Company had been reducing the price; consumers day by day had been increasing the use of gas for different purposes. They had now over 2000 cooking-stoves out on hire; and the smaller consumers, as well as the larger, seemed to rejoice in the stoves. The large reductions they had made—4d. per 1000 cubic feet in one part of the district and 3d. in the other part—would represent £600 to £700 less receipts for the Company. Consequently they would need to be careful, and hopeful that the consumers would try to do their best to help the Company.

On the proposition of Mr. A. W. OKE, seconded by Mr. WORTHINGTON CHURCH, the Chairman and Directors were heartily thanked for their services.

Authorization of New Capital.

An Extraordinary Meeting was then held to consider the creation and issue of additional capital.

The CHAIRMAN moved that the Directors be authorized to issue a further £30,000 of additional capital, and to borrow, by the creation of debenture stock, £10,000 in respect of such additional capital, in such manner and at such times as might be determined. He observed that the Company were progressing at such a rapid rate that it was absolutely necessary they should be in a financial position to cope with the additional demands.

Dr. GLAISHER seconded the motion.

Mr. OKE suggested that the resolution should embrace a discretionary power to the Board to raise preference capital. He thought it would be to the advantage of the existing shareholders if a portion of the stock was in the form of preference capital. The consumers, too, would indirectly benefit. After some years' experience, he had no hesitation in strongly urging the advisability of this.

The CHAIRMAN remarked that they sold both their ordinary and debenture stock by auction; and the conclusion the Board had arrived at was that it would be better to pass the resolution in the form in which he had read it.

The resolution was unanimously adopted; and the proceedin: terminated.

THE CHARGE FOR WATER IN THE CITY.

Proposed Alterations by the Water Board.

At the Guildhall last Wednesday, there was a large gathering of citizens and ratepayers to protest against the proposals contained in the Metropolitan Water Board (Charges, &c.) Bill, as affecting the City. The Lord Mayor and Sheriffs attended in state. The Lord Mayor presided, and in opening the proceedings explained that the Water Board had promoted a Bill providing for a uniform scale of charges applicable throughout their area of supply. Those who held property in the City thought that this was not a fair arrangement; and it was in order that they might express their views that the Corporation had, on requisition, granted the use of the Guildhall.

The first speaker was Sir F. Banbury, M.P., who moved the following resolution: "That this meeting of owners and occupiers of business premises in the City of London strongly protests against the provisions of the Metropolitan Water Board (Charges, &c.) Bill in Parliament, introduced by the Metropolitan Water Board, which Bill, while professing to be merely a measure for equalizing the rates to be charged for water throughout the Metropolitan area, will in effect enormously increase the rates at present levied for water supplied to business premises in the City and elsewhere." He observed that the Act of 1902 provided that the Water Board should within a given time introduce into Parliament a Bill to make uniform the scale of charges in its area of supply. The words were "introduce into Parliament," and therefore the Water Board were obliged to introduce the Bill. There was, however, no obligation to do more than that, and as the Bill had been introduced, and had met with almost universal condemnation, they would have fulfilled their obligation if they took no further steps. One result of the Bill, if passed, would be to increase the charge for water practically in every district in London. The Bill went farther than the proposed uniform scale of charges. Among other things, it provided that the charge for water for trade purposes, which was so important in the City, could be raised to 1s. per 1000 gallons. The New River Company were obliged to supply water for trade purposes at from 6d. to 7d. per 1000 gallons. It was estimated by the Board that the sum obtained from these extra charges would not be sufficient by £21,000 to meet their obligations. If this were correct, it was evident that they could not refuse to exact the full charges which they asked for power to make. The Stock Exchange buildings between Throgmorton Street and Old Broad Street paid at present for water £530 a year; under the Bill, the amount would be £1750. For its outlying buildings the cost would be increased from £224 to £475. The leaseholders of offices in Austin Friars informed him that, whereas they were now paying £43 for their water supply, they would have to pay £101 under the Bill. There was no reason, if the Water Board managed their affairs in a businesslike and economical manner, why these proposed additional charges should be imposed, and the trade of the City injuriously affected.

In seconding the motion, Sir Felix Schuster contended that the Bill did not carry out the principle of equalization of the rates, but, on the contrary, placed an unfair burden on those who had to pay them in the City. Under the old arrangement, the rate charged by the New River Company was 3 per cent. on the gross assessment; but under the Bill it would be 5 per cent. He had a case in his mind where the water payment, at present £600 a year, would be £3500. The supply by meter had been at the rate of 1s. per 1000 gallons; but, as the result of a calculation made in one particular instance, it was found that if the Bill became law, and was acted upon, the rate would be 27s. per 1000 gallons. The trade in the City depended upon a large number of small traders, and to them the hardship would be a very real one. He thought the Bill would inflict an injustice which needed only to be pointed out to prevent its being passed.

The resolution having been carried unanimously, it was agreed that a copy of the resolution should be forwarded to the Government, the Corporation, the London County Council, the Metropolitan Water Board, and the representatives of the City in Parliament, and that the Corporation be requested to offer strenuous opposition to the Bill.

Paris in Partial Darkness.—Owing to a strike among the workmen employed by the new Company who have obtained the concession for the supply of electricity in Paris, the city was plunged into partial darkness last Friday night. It is stated by the correspondent of "The Times" that the cause of the strike is an alleged onerous arrangement for the workmen introduced by the Company; the principal grievance being the reduction by one-half of the pensions of retiring employees. The strike came as a surprise—none of the morning papers having announced it; and consequently it caused enormous inconvenience. All the theatres and places of amusement were closed. The cafés and restaurants, only a few of which have retained their gas-fittings, had recourse to candles. At the Palais de Justice, the Courts had to be suddenly closed; and the Bourse du Travail was shut in the evening by order of the authorities. The strikers, numbering about 2000, were to have held a meeting there; but they were obliged to adjourn to other premises.

Gas-Engines Spoiled and Robbed at Milan Gas-Works.—From our Italian contemporary "Il Gaz," we learn that thieves have again been active in their depredations at the Union des Gaz Company's works at Milan. At the San Celso works, there are several gas-engines employed to drive various coal-elevators and coke plants. They are in duplicate, in case of repairs and breakdowns, and they run generally for between two or three months before changing over. The engines in reserve are enclosed in small houses, and locked up. These precautions were, however, of no avail; for when it was desired to put the reserve gas-engines into action, it was found that the houses had been broken into and damaged. The thieves had taken away all parts in bronze, bearings, and other accessories from the engines, two of which were of 50 H.P. and three of 25 H.P. each. They were, of course, rendered quite unusable for the time; and 3000 lire (£120) will have to be spent to put them into running order once more. The offenders have, we understand, been discovered and arrested, and prove to be employees of the Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The remains of Mr. William Young were laid to rest in the burying-ground at Peebles on Tuesday afternoon, by a large company of sorrowing admirers of the great man, among whom were the Provost and Magistrates of the Royal burgh, and a very good representation of the gentlemen who had been associated with the deceased in one or other of the branches of his life-work. Though the grave is in a modern part, the burying-ground has been a place of sepulture for centuries. It is a somewhat plain place, considering the character of the scenery which surrounds the pleasant town of Peebles; but what of that? "After life's fitful fever, he sleeps well." The labourer rests, but his work goes on. It will by-and-bye go on in a way which none of his friends ever contemplated it would. The benefaction he has left for the foundation of a sanatorium was one which was scarcely to have been expected of him. We would rather have expected, if we had contemplated his leaving of his means for public purposes, that his selection would have been some of the schemes for the extension of technical education which are so much in the air at the present day. Perhaps Mr. Young foresaw that in time to come technical education will be a matter of State provision; or he may have concluded that a lot of the technical education which is provided in schools and colleges is not of much value. But suffering humanity we shall always have with us. His great heart felt for those whom he saw to be afflicted. Himself a sufferer of long standing, he seems to have thought that whatever means he had to spare would be best applied in the alleviation of the sufferings of mankind. Does this not come near to the teaching of the greatest of all hearts which ever beat in this world, in which even the giving up of a cup of cold water was commended? And in the fixing of the name of "The Harehope," instead of "The Young," sanatorium, is there not a most complete compliance with the injunction not to do alms before men, to be seen of them, nor to let the left hand know what the right hand may be doing? These are thoughts which ought to be borne in mind when estimating the value of the great gift which Mr. Young has given to Peebles—a gift the full beneficence of which will be realized more and more with the advent of the ages.

The Scottish Junior Gas Association—Eastern District—held their last quarterly meeting for the session in Edinburgh on the 2nd inst. They have one more engagement before they go into vacation—a visit to the Broxburn Oil-Works on the 30th inst.; otherwise their winter's work is over. They have had a session which, as the President remarked, they have reason to be proud of. They have succeeded in carrying on the business of the session entirely by themselves; and there has been no sign of the enthusiasm with which the movement was started being allowed to flag. The meeting was a very good one indeed. Mr. Lill, who gave the paper on "Gas-Governors," is a Foreman Engineer in the employment of Messrs. James Milne and Son, Limited, in which capacity he has acquired experience in the handling and working of gas-governors, which enabled him to clothe his description of the different governors on the market with an amount of information as to details which lifted his communication above the character of a shop production, and converted it into a technical lecture. Disclaiming the giving of anything new, he crystallized the knowledge of the trade upon existing plants, bringing out the special features of the different types, making it, without doubt, easier for his hearers to handle a governor than they have, till now, experienced it. Then Mr. Leech's paper on elevators and conveyors was a very complete synopsis of the special qualifications of the different types of plant in use for these labour-saving purposes. He forced the conviction upon his hearers that the author of it had had a thorough and a wide experience of the subject he was treating upon. Mr. Leech has seen service both at home and abroad; and his reasonings show him to be not only thoroughly familiar with general principles, but a master of detail, ready with a reason for every view which he holds, down to the nature of the bolts and rivets to be employed. It was a noteworthy feature of both communications that they were pitched on the ground-work of personal experience, and had not the slightest smattering of the text-book or the class-room—a quality which adds greatly to the value of every production.

Edinburgh being one of the chief centres in which the manufacture of gas-meters is carried on, the Deputy Warden of the Standards has sent a communication to the Magistrates of that city, asking for any suggestions they may have to make with reference to proposed amendments of the Sale of Gas Act, 1859. The Magistrates procured a report from the Inspector of Gas-Meters—their own servant—upon the subject. They considered this report yesterday. The Inspector recommended that a range pressure of from 0·5 inch to 1 inch should be allowed. The present statutory pressure is 0·5 inch; and it is found that in many instances a meter will not work at so low a pressure. The Inspector also recommended that power should be taken to reject meters which, in testing, although registering correctly, in consequence of fault in mechanism showed unsteadiness or jumping of light, and that meters should be re-verified after a number of years. It was further recommended that, in the testing of meters *in situ*, the test should be with the pressure on the main. The Magistrates adopted the recommendations. With reference to the number of years after which re-verification should take place, six years was proposed; but, by a majority, the period of ten years was adopted. It is to be hoped that the Standards Department will go further than take the opinion of officials engaged in the administration of the statute. The meter makers have a large interest in the matter, and surely they will be consulted. The proposals of the Inspector in Edinburgh are certainly open to criticism. If a pressure of 5-10ths of an inch is found to be too low to drive a meter, let the pressure be raised to what would be sufficient. But a range of pressures would be a complicated matter to work, and might lead to the harassing of meter makers. The raising

of the standard of pressure might, again, be a matter of difficulty, because the minimum pressure of gas supply is, quite commonly, 6-10ths. There is room for discussion here. Power to reject unsteady meters should not be required, because it is not in the interest of any gas-meter maker to supply an unsteady meter. Besides, if the power were given, might it not be a fruitful cause of trouble between suppliers of gas and consumers? Whenever gas-lights became unsteady, whether rightly or wrongly, the meter would be blamed, and it would have to come out and be tested. Then, if the meter were found to be correct in every way, and the consumer had to pay for the testing, he would grumble. The testing of gas-meters *in situ* at the pressure on the main is almost a necessity. The re-verification of meters after ten years would not give much trouble, nor cause much expense, in towns where testing apparatus exists; but if all the meters in other towns were obliged to be sent to a testing centre every ten years, the cost of carriage would be considerable. There would also be the necessity for increasing the amount invested in meters, because when a meter was sent away to be tested—and no one could say how long it would be away—another would have to be put in its place. For these, and probably for other, reasons, the recommendations of the Magistrates of Edinburgh require to be carefully looked into.

Mr. W. Wilson, the new Gas Engineer and Manager at Falkirk, has had a busy time during the past ten days. On the evening of Wednesday of last week, he and Mrs. Wilson entertained the gas-works staff in their own house; a very pleasant evening being spent. On the succeeding evening, Mr. and Mrs. Wilson were the recipients of handsome gifts, which had been subscribed for by the officials of the Kirkintilloch Town Council, the gas-works staff, and a few friends. The presentation was made by Dr. Whitelaw, the oldest Corporation official, who paid a high tribute to the abilities shown by Mr. Wilson during the five-and-a-half years he had been Manager at Kirkintilloch, pointing out how he had, by his chemical knowledge, checked waste and cheapened the gas down to an unprecedented rate. Since he came to Kirkintilloch, the town had never been for five minutes without gas; and no fatal accident had taken place under his reign. They parted from him with regret; but congratulated him upon his good fortune. The presentations consisted of a roll-top escritoire for Mr. Wilson, and a gold bracelet for Mrs. Wilson. Mr. Wilson said that the little he had been able to do had been brought about by the able assistance he had had from the staff, who were a very dutiful and trustworthy lot of men. Although the public might not have known it, the town had been on the verge of darkness on several occasions, and had it not been for the way the men rushed into the breach, not sparing themselves, the town would undoubtedly have been on short rations at least. He left his friends at Kirkintilloch with great regret; but he would always remember them. Having thus taken formal farewell of his old place, Mr. Wilson took over his new duties at Falkirk on the morning of Monday last. The following day, he took part in the inauguration of the work in connection with the erection of a new gasholder at Falkirk, the Contractors for which are Messrs. Robert Dempster and Sons, Limited, of Elland. Bailie Bogle, the Convener of the Corporation Gas Committee, drove the first four rivets in the iron-work; the Town Clerk—Mr. Balfour Gray—drove the second four; and Mr. Wilson the third four. The ceremony was a private one. The new holder and tank are estimated to cost £10,750.

The further hearing of evidence in the action by Messrs. James Muir and Son, Limited, against the Edinburgh and Leith Gas Commissioners, with reference to the pollution of a brewery well, was to have been taken on Tuesday and Wednesday, but it has been postponed, at the request of the Commissioners, who have not yet concluded their searching underground for the source of the pollution. The case is now enrolled for Monday, May 20, by which time the Commissioners expect to be ready to lay the results of their mining operations before the Court. It has been arranged that the new evidence will be taken by Lord Ardwall, who tried the case in the Outer House.

The Lord Provost's Committee of the Edinburgh Town Council this week considered the proposal to have apparatus fitted up in the Municipal Chambers, for the use of the City Analyst in testing the illuminating power of the gas and electric lighting supplied. They resolved to recommend that apparatus to test the gas be fitted up, at a cost of £100; and for the testing of the electric light, at a cost of £10. What is the apparatus for testing the candle power of electricity? Would a bar photometer not do?

The Directors of the Larkhall Gas Company, in their report, stated that the net available balance for distribution for the past year amounted to £1482. They proposed the outlay of £600 of this sum in paying a dividend of 10 per cent., the placing of £200 to the reserve fund, and the carrying forward of £682. These proposals have been adopted, and power has been given to the Directors to increase the capital of the Company by £3000.

The Corporation of Peterhead have accepted the tender of Messrs. Henry Balfour and Co., Limited, of Leven, Fife, amounting to £1937, for the work, recently detailed in these "Notes," in connection with the extension of the gasholder capacity in the works.

Under a new regulation for the lighting of common stairs, which came into force on Dec. 5 last, there were prosecutions, in the Police Court of Dundee, on Saturday last, of eight proprietors and house actors, against whom the charge was that they had failed to comply with notices requiring them to attend to the lighting of stairs in their properties. One case was withdrawn, three others were continued, and evidence was led regarding the others. Bailie Melville, who presided, said as the cases before him were of the nature of test cases, he would limit the penalties to fines of 5s. each, with the alternative of imprisonment for 24 hours.

I mentioned in the "JOURNAL" for Feb. 26 that Mr. J. C. Robertson, C.A., the Auditor of the Dundee Water Accounts, had surcharged upon ex-Bailie Ballingall, the Convener of the Water Committee, £24 of the £104 which the annual inspection in June last of the water-works at Lintrathen cost. Since then the Town Clerk of Dundee, who is also Clerk to the Water Commissioners, prepared a report upon the subject, in which he expressed his opinion that the Auditor had exceeded his powers. In his opinion, all that the Auditor could do was to call attention to any payment which he might consider to be unauthorized expenditure, and leave it to the Commissioners to do what they might consider fit to obtain a legal remedy—which is by application to the Sheriff. The report was submitted to a meeting of the Town Council as Water Commissioners on Thursday night. There was an angry discussion; one of the councillors being accused of having stirred up the Auditor to take the action he did. In the end, it was resolved, by 14 votes to 12, that no further action should be taken.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 673.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5¾	..	5 1 10
50,000	10	Feb. 28	14	Bourne-mouth Gas & Water 10 p.c. Pref.	27—28*	..	5 0 0
51,810	10	,,	7	Bourne-mouth Gas & Water B 7 p.c. Pref.	16¼—17*	..	4 2 4
53,200	10	,,	6	Bourne-mouth Gas & Water 6 p.c. Pref.	14½—15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250—255*	..	4 18 1
300,000	,,	,,	9½	Do. New	190—195*	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122	..	4 2 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	225—230	..	4 17 10
246,320	,,	,,	8½	Do. A. Ord. Stk.	163—168	..	4 18 3
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	118—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	89—93	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9½	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	56—98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,443,280	Stk.	,,	5/10	Commercial 4 p.c Stk.	107—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	105—105	..	4 12 7
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	122—125	—1	5 4 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
460,170	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103—105	..	3 16 2
486,090	10	Jan. 31	11	European, Ltd.	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4 1/16	Gas-light & Coke 4 p.c. Ord.	95—97	..	4 10 10
2,600,000	,,	,,	3⅜	Gas-light & Coke 3⅜ p.c. max.	87—89	..	3 18 8
3,799,735	,,	,,	4	Gas-light & Coke 4 p.c. Con. Pref.	106—108	..	3 14 1
4,193,975	,,	Dec. 13	3	Gas-light & Coke 3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6½	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19¾—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	179—182	..	4 7 11
473,600	Stk.	Feb. 14	3⅜	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c.	120—125	..	4 16 0
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5
561,000	Stk.	Feb. 28	10	Liverpool United A	223—225*	..	4 8 11
718,100	,,	,,	7	Do. B	164—165	..	4 4 10
144,140	Stk.	Feb. 14	7⅝	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of Melbourne 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Met. of Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3⅜	Monte Video, Ltd.	11½—12½	..	5 12 0
1,775,892	Stk.	Feb. 28	4⅝	Newc'tle & G'tesh'd Con.	107—109	..	4 4 10
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	1	,,	7	Do. 7 p.c.	13—14*	..	5 0 0
300,000	Stk.	Nov. 29	5	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6⅝	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7¾—8¼	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	123—125	—1	4 8 0
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	158—160	..	5 0 0
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Feb. 28	6½	Tottenham A 5 p.c.	123—126	..	5 3 2
398,940	,,	,,	5	Tottenham B 3½ p.c.	101—103	..	4 17 1
137,500	,,	Dec. 28	4	Edmonton 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	104—106	..	4 14 4
30,000	Stk.	Feb. 14	8	Wands-worth A 5 p.c.	—	..	—
255,636	,,	,,	6½	Wands-worth B 3½ p.c.	138—143	..	4 10 11
75,000	,,	,,	5⅜	Wands-worth C 3½ p.c.	111—113	..	4 19 1
79,416	,,	Dec. 28	3	Putney 3 p.c. Deb. Stk.	79—82	..	3 13 2
845,872	,,	Feb. 28	5⅛	West Ham 5 p.c. Ord.	101—104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

CURRENT SALES OF GAS PRODUCTS.

Week ending March 9.

Tar products in the London market remain steady. Pitch has again been in very good demand, and from 27s. 6d. to 28s. is now the quotation. In some cases 27s. 6d. even has been declined. Higher prices have again been paid for creosote, more especially for local consumption. The price can now be called 2¼d. to 2⅜d. at makers' works. Benzol, 90 per cent., is hardly so good, and stands at between 10½d. and 10¾d. 60° crude carbolic is without change; but crystals are much easier. The feeling as to anthracene is distinctly better, and 1¾d. per unit for 40 to 45 per cent. has been freely bid, and more business has been done at the price. Although shipments of sulphate of ammonia have been extremely good this season, the price does not improve, but on the other hand is actually a little lower; the value on Beckton terms being to-day £12 to £12 2s. 6d. per ton for prompt, and barely that price could be obtained for further forward. Sulphate of ammonia is so much cheaper per unit than nitrate of soda at the present time that more attention is being given to the former; and it is difficult to understand why the price does not improve.

LIVERPOOL, *March* 9.

Sulphate of Ammonia.

In the early part of the week, prices were somewhat irregular, owing to the second-hand selling. Later, however, there has been more buying; and, supplies not being too abundant, the market closes with a rather firmer tone. The quotations are £11 17s. 6d. per ton f.o.b. Hull, £11 18s. 9d. to £12 per ton f.o.b. Liverpool, and £12 to £12 2s. 6d. per ton f.o.b. Leith. There has been considerable inquiry in the forward position; but while makers are looking for a premium on prompt prices, buyers do not seem inclined to operate unless at a discount. In making overtures for business, buyers are not in fact very serious. Consequently, actual transactions have only been on a limited scale.

Nitrate of Soda.

This article remains very firm, and spot prices are maintained at 11s. 6d. per cwt. for 95 per cent., and 12s. per cwt. for refined quality.

LONDON, *March* 9.

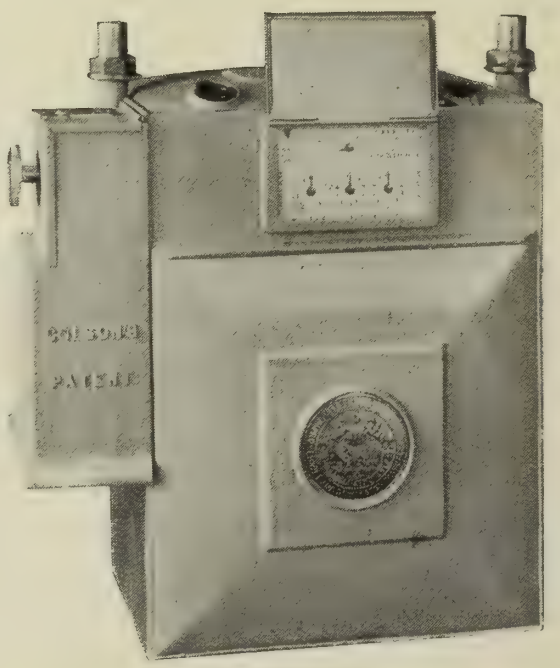
Tar Products.

There has been little alteration in the market during the past week. Pitch has maintained its position; and it is evident that the London manufacturers are now pretty well sold, having cleared out for the present the quantities which they wished to dispose of for this half of the present year. On the east coast, business is reported to have been done at 25s. 6d. for the best Yorkshire makes. On the west coast, business could still be done at outside ports at 24s. Consumers in South Wales appear to be amply covered for their present requirements; while on the Continent, buyers are only interested for next season, and at present will not pay the prices indicated by dealers. Creosote is very firm indeed; and a small quantity of London oil is reported to have been sold at a good figure for prompt delivery. Manufacturers themselves are out of the market just at present, preferring to await the course of events before selling any further quantity. In the Midlands, oil is very scarce indeed, and good prices are reported to have been paid; while in the North, manufacturers prefer to wait before selling any further quantity. Benzol, 90 per cent., is very quiet indeed, and business is said to have been done f.o.b. London at 11d. per gallon; while on the east coast, 10d. is stated to have been accepted. Benzol, 50 to 90 per cent., is scarce, and in good demand. The quantity of toluol offering is decidedly small, and good prices are paid for same. Solvent naphtha is quiet. Business is reported to have been done at 1s. 1½d. on the east coast; while a country make was offered at 1s. 3d., on rails London, without success. Some quantity of good "A" quality anthracene was sold at 1½d. per unit delivered to consumers' works; and for inferior makes, only 1¼d. was realized on the same terms. Carbolic acid is easier. Continental consumers report having purchased at 1s. 8¼d. on the east coast, and now refuse to offer more than this figure; while English consumers will only pay the parity of this at makers' works. Crystals are quiet; and it is probable that makers would accept something under current quotations for a good contract.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 26s. to 26s. 6d.; east coast, 25s. to 25s. 6d.; west coast, 24s. to 24s. 6d. Benzol, 90 per cent., 10d. to 11d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2½d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1⅝d. to 1s. 2½d.; heavy naphtha, 1s. 3d. to 1s. 4d. Creosote, London, 2⅛d. to 2¼d.; North, 2d. to 2⅛d. Heavy oils, 2¾d. Carbolic acid, 60 per cent., 1s. 8¼d. to 1s. 8½d. Naphthalene, £6 to £10; salts, 35s. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

This article has been decidedly quiet during the past week, and prices have had a downward tendency. The principal London makers still maintain their price of £12 2s. 6d. on their own special terms; but business could be done upon f.o.b. London terms at £11 17s. 6d. In Hull, buyers have refused to give £12 for one of the best makes; and it is improbable that anything over £11 15s. to £11 16s. 3d. could be secured for ordinary qualities for prompt delivery. In Liverpool, business is reported at £11 17s. 6d. and £11 18s. 9d., but only for small quantities. In Leith, manufacturers are well sold, and are unable to entertain further business just at present; but they certainly would not be able to secure anything over £12 were they in the market.



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COAL TRADE REPORTS.

Lancashire Coal Trade.

General firmness characterizes the Lancashire coal trade. Prices in all branches are well maintained. There is no likelihood of any variation in terms until after Easter, if then. The wages question is in abeyance. Many railway and other contracts terminate this month, and a good deal of correspondence as to new contracts is passing between colliery proprietors and railway companies, mill owners, and gas manufacturers. In the present state of the market, it is certain that more money will have to be paid by contractors. The weather continues in favour of sellers. Coal exports from the Ship Canal continue in enlarged quantities. Welsh coal is cheaper; the best "Admiralty" being from 2s. 6d. to 3s. less than a month ago. The average quotations at the Manchester Coal Exchange are as follows: At the pits, best house coal 14s. 6d. to 15s. 6d. per ton, secondary 13s. 6d. to 14s. 6d., common 10s. 6d. to 12s. 6d., burgy, 8s. 10d. to 9s. 6d., best slack 8s. to 9s., medium and common 7s. to 8s., coal for export and bunkering 12s. to 13s. f.o.b. at Garston. Furnace coke is scarce and dear, varying from 17s. to 24s.

Northern Coal Trade.

There is still some irregularity in the coal trade of the North-east—on the one hand, the more settled weather having allowed the shipments, coastwise and foreign, to be increased; but on the other, there is the falling off in the local consumption which is usual in periods of milder weather. Steam coals continue rather quiet. Best Northumbrians are from about 14s. 3d. to 14s. 6d. per ton f.o.b.; second-class steams are 13s.; and steam smalls are firm at 8s. 3d. to 8s. 6d. The production at the pits seems to be full, and to be well taken up. In the gas coal trade, owners still report a very full demand, and appear to adhere to the prices that have been recently quoted, though buyers look for some ease as the season advances. Durham gas coal is still quoted, according to quality, from about 12s. to 13s. per ton f.o.b., with one or two special kinds at perhaps 3d. per ton above the higher price; and some sales for export are being made—though not in large lots. There is nothing to add to what was stated last week as to the long contracts—buyers seem to believe in waiting. In the coke markets there is further ease, which would influence gas coke if it were not for the lessening output of the latter. Good gas coke varies from 13s. 9d. to 14s. 9d. per ton f.o.b.; and the stocks seem to be generally less than they were, while the demand is relatively steadier.

Scotch Coal Trade.

Coal continues to be in great request, and prices are at present higher than they have been since the rise began, without, too, any prospect of their coming down. The demand for export is exceptionally strong. The prices quoted are: Ell 12s. 6d. to 13s. 9d. per ton f.o.b. Glasgow, splint 13s. to 13s. 6d., and steam 12s. to 12s. 3d. The shipments for the week amounted to 291,695 tons—an increase of 72,849 tons upon the previous week, and of 65,476 tons upon the same week of last year. For the year to date, the total shipments have been 2,084,686 tons—an increase of 109,743 tons upon the corresponding period of 1906.

Pontefract Gas Arbitration Award.

On the 4th ult., and several subsequent days, an arbitration took place at the Surveyors' Institution—with Sir Hugh Owen as Umpire—to fix the price to be paid by the Pontefract Corporation for the undertaking of the local Gas Company (*ante*, pp. 415, 484). The price claimed by the Company (for whom expert evidence was given by Mr. W. A. Valon, Mr. H. E. Jones, Mr. Henry Tobey, and Mr. Ernest W. Drew) was £89,016: while the Corporation's advisers (Mr. E. H. Stevenson, Mr. John Wilkinson, and Mr. W. B. Keen) valued the undertaking at £60,438. By his award, Sir Hugh Owen has fixed the sum to be paid at £69,600.

Price of Gas to Prepayment Consumers at Salford.—In reply to a question by Mr. Jackson as to whether the prepayment consumers paid 30 per cent. more for their gas than those using ordinary meters, Alderman Phillips, the Chairman of the Salford Gas Committee, said he did not believe the Gas Committee made a profit out of the slot meters. The people using them were charged 2s. 9d. per 1000 cubic feet; while the ordinary consumers paid 2s. 7d., with a deduction of 4d., making a net price of 2s. 3d. per 1000 cubic feet. Mr. Jackson retorted that he could not understand the argument that the penny-in-the-slot system was unprofitable.

Sales of Shares.—Messrs. Sadler and Baker offered for sale last Thursday 600 additional £10 shares in the Frimley and Farnborough District Water Company; and they fetched £14 10s. and £14 12s. 6d. each—an average of £14 10s. 8d. The total amount realized by the sale was £8718 15s. Tenders for the issue of £25,000 of "D" stock of the Croydon Gas Company, recently invited in our columns, were opened last Wednesday. The whole of the stock was allotted at prices ranging from £109 5s. to £112 per £100 of stock. The average price obtained was £109 6s. 10d.; applicants at the lower price receiving 92 per cent. of the respective amounts applied for.

Newquay District Council and the Water Bill.—As notified in our "Parliamentary Intelligence," the opposition to the Newquay and District Water Bill has been withdrawn. One of the main differences of opinion between the Urban District Council and the Water Company was as to the scale of charges; the Council contending that the differences in the present graduations are too great. It has been agreed by the Company to adopt the graduation proposed by their Bill of last year, subject to certain modifications and to a reduction in the charge for baths, &c. It has also been agreed that certain proposals by the Council as to capital shall be incorporated in the Bill.



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LEST YE FORGET.

Gas Supply in the Colonies.

The Maryborough (Queensland) Gas Company, Limited, had a profit balance of £1058 for the six months ending the 31st of December last, and out of it a dividend at the rate of 6 per cent. per annum was declared at the half-yearly meeting on the 1st ult. This absorbed £771, and left a balance of £287 to be carried forward. The North Shore (Sydney) Gas Company, Limited, had a net profit of £5552 on the sale of gas, &c., in the second half of last year, after allowing for reserve and depreciation; and a sum of £32 was carried forward. Out of the total, a dividend of 3¾ per cent. (free of income-tax) was declared for the six months, amounting to £5621, and leaving £63 to be carried forward. The Directors reported at the recent half-yearly meeting that the Company's plant was in a very satisfactory condition. An installation of inclined retorts, with coal breaking and conveying plant, which had been put in, was stated to be working satisfactorily. In view of the rapid increase in the population of North Shore, the Directors have purchased about 10 acres of land at Table Bay, on which additional works can be erected when they are required.

Coal and Gas Consumption in American Cities.

The consumption of coal and gas per head in the six leading cities of the United States is given in a recent issue of "Stevens' Indicator" as follows:—

	Population.	Coal. Short Tons.	Gas. Cubic Feet.
New York	4,014,000	3·12	8800
Chicago	2,020,000	4·00	5840
St. Louis	714,600	7·55	5600
Boston	602,500	6·70	5120
Cleveland	465,000	5·43	3230
Cincinnati	425,000	8·20	5180
Average	1,374,000	4·42	7017

Of the total coal burned in these six cities, aggregating 36,428,000 short tons, 23,588,000 tons were bituminous, while the anthracite amounted to 12,840,000 short tons. The anthracite percentage was about 35. In the several cities the anthracite percentages were as follows: New York, 72; Chicago, 17; St. Louis, 3; Boston, 45; Cleveland, 13; Cincinnati, 1. Our contemporary the "Iron and Coal Trades Review," says the low consumption of coal per head in New York, with correspondingly high consumption of gas, is accounted for partly by the congested population, which tends to increase the number of apartment houses and hotels, where many families are supplied with heat from a single central plant, and where a large share of the cooking is done by gas-ranges, and partly because the city is so pre-eminently a commercial one, rather than strictly a manufacturing community, as is so largely the case with the others.

Automatic Street Lighting at Bournemouth.

In connection with a decision by the Bournemouth County Borough Council to renew their agreement regarding the use of automatic street-lamp controllers for a further period of twelve months, and to extend the system, the Lighting Inspector's report is of interest. He stated that during the past three months—viz., November, December, and January—of the lighting, extinguishing, &c., with the automatic controllers, the cost of gas was £209, as against £235 for the same number of lamps without controllers for the same period of the previous year, showing a saving of £26. As to the maintenance of mantles and cleaning of lamps, also the rent of automatic controllers, the cost of this was £86, as against £107, thus showing a saving on the maintenance account of £21. Assuming that the lamps along the main roads which are kept lighted all night were not fitted with controllers, and had to be extinguished by hand, it would necessitate the employment of two men for extinguishing them, at an additional cost of £12 10s. for the three months. The total amount saved for the above period was £60. The lighting, extinguishing, and cleaning of the lamps that are fitted with automatic controllers has been satisfactorily carried out during the past three months.

Reductions in Price.—The Directors of the Horley Gas Company have decided to reduce the price of gas 4d. per 1000 cubic feet as from the 1st of July next. The price of gas at Farnham has been reduced to 3s. 4d. per 1000 cubic feet as from the beginning of the year. The Directors of the Enfield Gas Company have decided to reduce the price of gas to 3s. 5d. per 1000 cubic feet to users of stoves, and to 3s. 2d. to ordinary consumers.

Berlin Water Supply.—The history of the supply of Berlin with water is set forth in a recent number of the "Gesundheits-Ingenieur." The matter was at first entrusted to an English Company, who obtained a concession for 25 years from July 1, 1856, to July 1, 1881. The Stralau works erected by them were in operation by April 1, 1856, and were capable of providing a daily supply for 300,000 persons. The additional works erected later on Lake Tegel and Lake Müggel are described; and the subsequent efforts made to obtain a supply of well water by sinking numerous tube wells are explained. In spite of difficulties caused by the amount of iron in solution, it has now been possible to reconstitute both of these works, and to obtain a daily supply of water from wells, amounting to 20 million gallons from Lake Tegel and 44 millions from Lake Müggel. These latter works will be fully completed in the spring of the present year. During last summer, the contemplated number of tube wells proved insufficient to yield the necessary volume of water, and considerable extensions in the length of the underground galleries had to be undertaken. It is stated that the volume of water per head of the population, for the 2 million inhabitants of Berlin and its suburbs for whom a supply is needed, is constantly on the increase, and the supply now reaches 30·8 gallons per head per diem.

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The Boultham Boring at Lincoln.—Some weeks ago, the Lincoln City Council decided (*ante*, p. 421) to continue the deep boring at Boultham for some distance further, in the hope that, by passing into different strata, water more suitable for domestic purposes might be met with. This has been done; but it seems that, though the sandstone has been pierced right through, the quality of the water has not improved. There is, however, yet hope that if there is persistent pumping, with the pumps placed at the depth originally intended (400 feet), the water which has been long stagnant may be removed and a pure supply obtained. The one great disappointment is stated to be the fact that the gravel beds, which are the best water-bearing strata, have not been met with to any appreciable extent; but at the same time, there is an abundant flow of water.

Gas Profits and the Rates at Hereford.—An intimation by the Hereford Gas Committee that they had ordered the sum of £1000 to be transferred to the improvement fund at the end of the financial year, led to some discussion at last Tuesday's meeting of the Town Council. Mr. Langford protested against the transfer, though he admitted that their Special Act enabled the Council to adopt such a course. It was argued that such an arrangement saved a sewers rate; but he pointed out that this meant that the people who consumed gas paid the rate, which would otherwise be collected from the whole of the ratepayers of the city. Seeing the Committee secured such a large profit, they might consider the advisability of making a reduction in the price of gas. One of the results of the present high charge was that customers who had used Corporation gas for power purposes were now putting in suction-gas plant. Mr. Witts, however, remarked that the price was now only 2s. 6d. per 1000 cubic feet, and 2s. 3d. for power.

An exhibition of the gas cooking, heating, and lighting appliances of Messrs. R. & A. Main, Limited, and Messrs. Falk, Stadelmann, and Co., Limited, was held under the auspices of the Corporation of Dumfries, in St. Mary's Hall from Monday to Friday of last week. Messrs. Main had on view cookers of different types, and a large variety of gas-fires. Messrs. Falk, Stadelmann, and Co. had a profuse display of lighting appliances. The exhibition was opened by Provost Glover, who recommended the use of gas cooking-stoves and incandescent lighting as a means for reducing the expense of the home. Miss E. M. Dods, Principal of the Dundee School of Cookery, lectured twice daily during the week. The exhibition was well patronized, especially at lecture times.

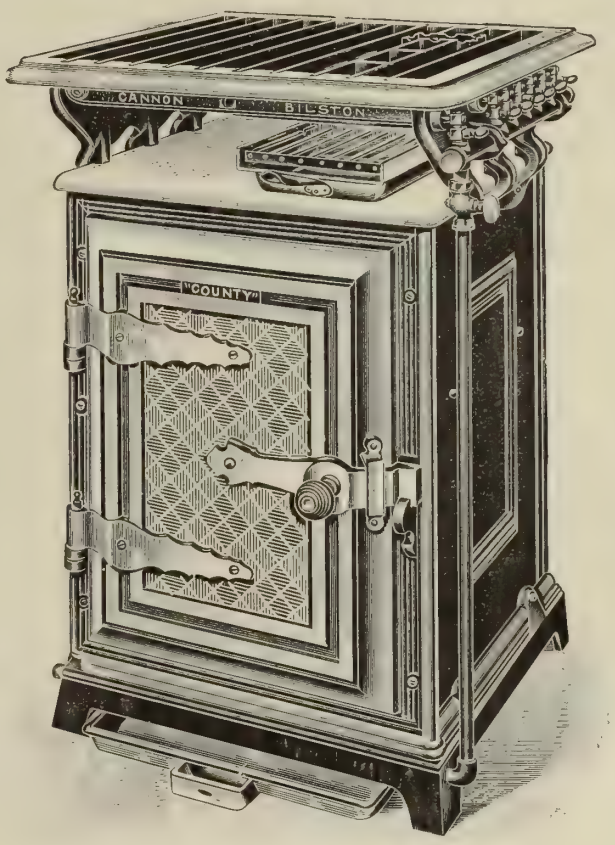
In the report of the Directors of the Richmond Gas Stove and Meter Company, Limited, for the year ending Dec. 31 last, they state that the balance standing to the credit of the profit and loss account (after deducting debenture interest), including the amount brought forward, is £31,768, which they recommended should be appropriated as follows: Depreciation, £4819; dividend on preference capital at the rate of 6 per cent. per annum, £5933; dividend (free of income-tax) at the rate of 10 per cent. per annum on the ordinary capital, £8036; bonus (free of income-tax) at the rate of 2½ per cent. per annum, £2009; reserve fund (bringing it up to £40,000), £4671, the Directors add that the business of the Company continues to be satisfactory; and it is gratifying to them that they are able, after placing the entire cost of advertising, as in former years, against revenue, to again recommend a dividend at the rate of 10 per cent., and a bonus of 2½ per cent. in addition. During the year the sum of £15,433 was expended on the new foundry at Grappenhall. The report was submitted to the shareholders at the annual meeting of the Company last Thursday, and adopted; and the dividend recommended, with the bonus, was declared. In the course of the proceedings, the Vice-Chairman (Mr. H. M. Thornton) said the balance-sheet was by far the best they had produced.

The annual report which was adopted at the seventeenth ordinary general meeting last Thursday of John Wright and Eagle Range, Limited, showed that the profit for the year to Dec. 31, after providing for contingent reserve, and charging Directors' fees, Managing-Directors' remuneration, and depreciation on buildings and plant, amounted to £54,113. After adding the balance brought forward from last year (£8514), and deducting the interim dividend paid in August last (£17,948), there remained at disposal the sum of £44,679. The Directors recommended a dividend at the rate of 6 per cent. per annum for the half year on the preference shares, less income-tax; a dividend of 2s. 6d. per share on the ordinary shares, free of income-tax; £8000 to be taken to the reserve fund; and £8381 to be carried forward to next year. The Chairman (Mr. G. E. Wright) said he thought they would agree that the report showed a continuance of that steady progress which had characterized the Company since its formation. They had had to meet a very great advance in the cost of raw materials during 1906; but, unfortunately, they had not been able to obtain advanced prices for the goods they had to sell. The results shown, therefore, were slightly less favourable than last year; but they were eminently satisfactory. It would be interesting for them to know they had commenced 1907 with advanced prices; and they started the year under considerably more favourable circumstances than those which obtained last year. The latest branch of the business—the British Radiator Company—which they started some two years ago, was making steady progress, and promised to be a source of considerable profit and strength. It might strike some of them as peculiar that, though the profits were only £600 less than last year, they were carrying £2000 less to the reserve fund, and were also carrying forward a slightly smaller balance. If, however, they looked into the matter, they would easily see where the apparent difference arose. Last year they carried £10,000 to the reserve fund; but they did this at the expense of reducing the amount that was to be brought into the year. Therefore, whereas they had the sum of £9970 to bring into the accounts last year, this year they only had £8500. Dealing with the balance-sheet, he said that the whole of the increase of nearly £10,000 which had been spent during the year had been in adding to their buildings and plant. The report was adopted, and the dividends recommended were declared; it being pointed out that this was the tenth consecutive year in which the Company had paid 20 per cent. per annum.

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Messrs. Joseph Taylor and Co. have received an order from the Runcorn Gas Company for one of their latest makes of solid plate lead saturators, delivered and fixed on their foundations; also one for an open saturator for the Bromley (Kent) Gas Company.

The Automobile Gas Producer Syndicate, with its office at No. 99, Great Clyde Street, Glasgow, was recently registered in Edinburgh. The capital is £3000, in £1 shares, for which the public are not invited to subscribe. The Silverwood Light Oil Company, Limited, has been registered, with a capital of £100, in £1 shares, to treat and manipulate coke-oven gases to extract benzol and other bye-products, &c.

The Lithgow (New South Wales) Borough Council have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for the apparatus, consisting of retort-bench, retort-house roof, condensers, purifiers, &c., required to re-model their existing gas-works.

Messrs. F. C. Sugden and Co. have had orders placed with them for a new retort-bench and ironwork (the settings being of the shallow regenerative type) by the Whitworth Vale Gas Company; and for semi-deep regenerator settings and ironwork by the Llangollen Gas Company, Limited, and the Bridgend Gas and Water Company—the last one being a repeat order.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Crowborough Gas Company. Applications by March 16.
DRAUGHTSMAN. Newton, Chambers, and Co.
DRAUGHTSMAN. No. 4734.
DRAUGHTSMAN. No. 4741.
CHEMIST. No. 4740.
OUTDOOR SUPERINTENDENT. Devonport Gas Department. Applications by March 22.
GENERAL FOREMAN. No. 4739.
METER INSPECTOR. Warwick Gas-Works.
SHOW-ROOM MANAGER AND SALESMAN. Folkestone Gas Company.
COAL REPRESENTATIVES. No. 4736.
FITTER. No. 4737.
MAIN AND SERVICE LAYER. Devonport Gas-Works.

Situations Wanted.

ASSISTANT-MANAGER OR DRAUGHTSMAN. No. 4731.
INDEX READER AND OFFICE WORK. 50, Woodward Road, East Dulwich.
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WORKING FOREMAN. No. 4738.

Plant, &c., For Sale.

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GAS-ENGINE. "G.S.," c/o West End Advertising Agency.
GAS-PIPES (6-INCH). Broom and Wade, High Wycombe.

Company Meeting.

BRITISH GASLIGHT COMPANY. Offices. March 27. Twelve o'clock.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. March 19.
BRIGHTON AND HOVE GAS COMPANY. March 19.
LEATHERHEAD WATER COMPANY. March 25.
NEWPORT (MON.) GAS COMPANY. March 22.
NORTH MIDDLESEX GAS COMPANY. April 8.
PINNER GAS COMPANY. March 21.
SOUTHGATE AND DISTRICT GAS COMPANY. March 19.
TENDRING HUNDRED WATER COMPANY. March 19.

TENDERS FOR

Coal.

COMMERCIAL GAS COMPANY. Tenders by March 14.
PERTH GAS DEPARTMENT. Tenders by March 23.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Coke.

WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 18.

Fire-Clay Goods.

STOCKPORT GAS DEPARTMENT. Tenders by March 21.

General Stores, Shovels, Picks, Oils, Ironmongery, Brass and Copper Work, Fittings, Lime, Lead, Lead Pipe, &c., &c.

PERTH GAS DEPARTMENT. Tenders by March 23.
ROCHDALE GAS DEPARTMENT. Tenders by March 20.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Iron and Steel Work, Castings, &c.

BURY CORPORATION. Tenders by March 19.
ROCHDALE GAS DEPARTMENT. Tenders by March 20.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Mantles.

STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Meters.

LEEDS GAS DEPARTMENT. Tenders by March 25.
PERTH GAS DEPARTMENT. Tenders by March 23.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Oxide of Iron.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 25.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Pipes, &c.

PERTH GAS DEPARTMENT. Tenders by March 23.
ROCHDALE GAS DEPARTMENT. Tenders by March 20.
STOCKPORT GAS DEPARTMENT. Tenders by March 21.

Sulphuric Acid.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 25.
PERTH GAS DEPARTMENT. Tenders by March 23.

Tar and Liquor.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by March 22.

Water-Gas Plant.

WIGAN GAS DEPARTMENT. Tenders by April 2.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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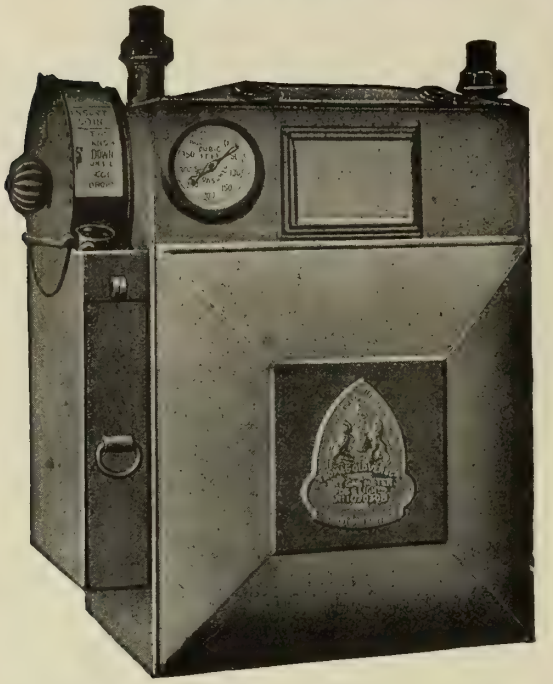
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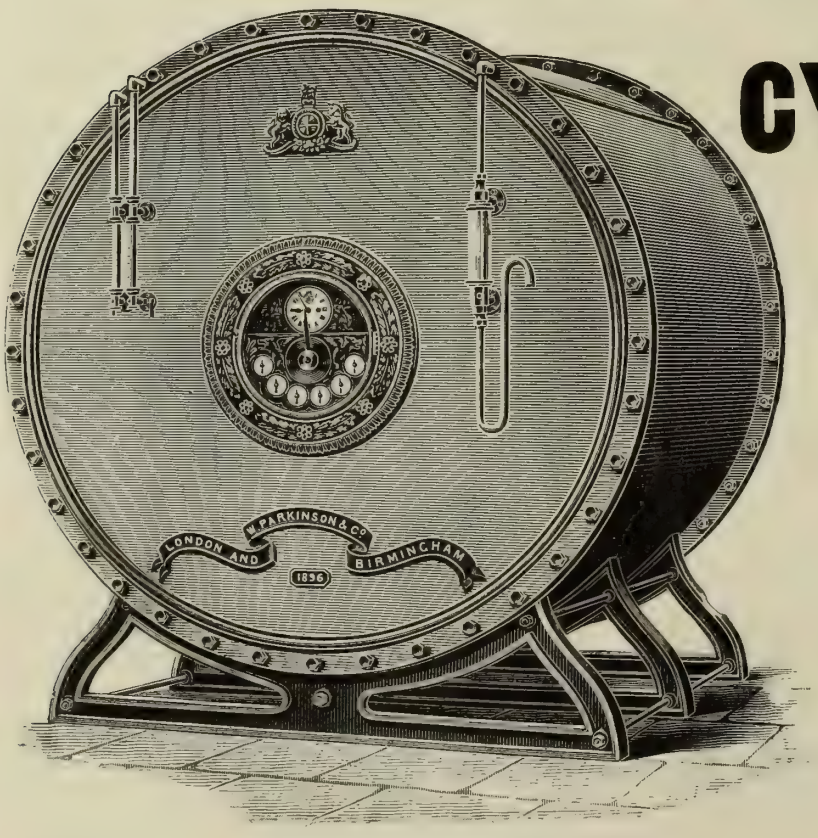
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VOL. XCVII., No. 2288.—TUESDAY, MARCH 19, 1907.

EDITORIAL NOTES—GAS, &c.

Gas Supply in the Provinces.

DURING the past few weeks, we have been publishing in the "JOURNAL" an epitome of the results of (as the case may be) the half-year's or year's working of Gas Companies carrying on operations in the Provinces. The number of reports and accounts that now reach us necessitates the making of a judicious selection, with the double view of confining notices to special points, and of making the periodical survey fairly representative. In this, it is believed we have succeeded. In the particulars that have lately been published, there is found every cause for gratification, though in one or two buying and selling branches of the business it could be wished that things had been a little more benign throughout the whole year. But whether we look to the general results of Companies operating in the North or in the South, or in the East or in the West, or round the coast or inland, the same evidence of progress is found, and the same symptoms of continuation, though the rate of advance may be slackened if the unreasonable demands of the coal owners are persisted in, and by their covetousness gas prices are forced to ascend. As the reports are read, and their features noted, it is borne in upon one how largely the gas industry, under the conditions of its trading, has been conducted for the benefit of the country at large—supplying, as it does, through its statutory undertakings alone, now some $5\frac{1}{4}$ millions of consumers and not far short of $\frac{3}{4}$ million of public lamps. It is an industry whose economies and technical advances have been very largely utilized to benefit the consumers, as is amply demonstrated by a comparison of prices for gas and the interest realized by shareholders upon their investments now and during past years of normal conditions. The special figures presented at the meeting of the Bristol Gas Company (published on Feb. 12), though not unique, are instructively illustrative of this. The proprietors in this Company are only receiving 5 per cent. upon their capital, but step by step in the past fifty years the price charged to the consumers has been reduced from 4s. 6d. to 2s.

This consideration for the consumers is reflected in the reports from the Provinces for the past half year or year. From all over the country, increases in the consumption of gas are reported—from industrial and from purely residential towns, from market towns and seaside resorts; and this despite the continued supersession of the consumers' prodigal flat-flame burner by the incandescent burner, with its economy in gas intensified to a manifold degree by gain in the illuminating power. The effect of this supersession of the old by the modern is insufficiently appreciated by shareholders, and much less by those who, thankful for reduced expenditure, pay little heed to the source of its production. It is well to impress in public the saving power of the incandescent burner, as was done at the last meeting of the Harrogate Gas Company, when it was announced that in several cases by its aid consumption has been reduced by something like 50 per cent.; at the meeting of the Cork Gas Company, when it was mentioned that the examination of some hundreds of accounts had shown, through the same cause, an average decrease per consumer of 22 per cent.; and at the meeting of the Reading Gas Company, when notice was taken of a church in which the change from the ancient to the modern system of illumination effected in one quarter a reduction of 55 per cent. These are interesting facts, subjoined to which in public references might be the further one that, while waste of gas is always deprecated by suppliers, waste of gas in lighting under the new order of things has a much more modest bearing on accounts than under the old order. It is not only in increase in consumption that the half year has registered progress; but in the number of new consumers and new cookers and other heating appliances connected to the mains, we have failed to find a single instance of retrogression. The slot meter consumers are increasing apace. Newcastle is an example, with its addition of 9234 slots last year. Ever since the Company started this business, each year has seen the previous year's increase beaten. As to cooking-stoves, three-fifths of the consumers have them. In proportion, this portrays the condition of advance in these directions in other industrial centres.

This prosperity of the gas business was not supported in any marked measure during the year by the residual products. Almost throughout the country, the complaint is that in the forepart of the year values were low, and that it was only the brightening up of the coke market later in the year that made the trading in the residual products look as well as it did. There is no doubt that the great demand there has been of late upon the coke-ovens in the North consequent upon the prosperity of the iron and steel trades has had, and will continue to have, some effect on the sulphate of ammonia market, in view of the increased practice of ammonia recovery in those quarters. Some new markets for sulphate have been opened up; but propagating work will have to be fostered to maintain something like a correspondence between output and absorption. This also applies to tar.

However, the financial results of Provincial Companies for the half year or year were good, though two or three of the concerns whose affairs were noticed in our columns exhibited a decrease in their gas receipts. But in those cases, this was due to the increase of business not having overtaken the difference produced by reductions in price. Every reduction of price that is made, unless accompanied by economies in production, means a lessened profit per 1000 cubic feet; and it therefore follows that, with productive conditions stationary, each reduction necessitates a greater augmentation of business than on the previous occasion so as to counterbalance the decrease in receipts represented by the reduction. But the vitality of the industry is such that of the several Companies who made reductions in price last year, with few exceptions, the influx of business not only counterbalanced the voluntary renunciation of income, but enabled additions to be made to the carry-forward. It is apparent that the outlook in the coal market holds no terrors for some of the Provincial concerns, for here and there further reductions are announced—the one at Sheffield to prices ranging from 1s. 4d. to 1s. being more particularly noticeable. Companies who are making reductions at this time must, happily for them, be in a very secure financial position.

Reference has been made to the consumers being the most favoured participants in the economies and gains of the industry. Accounts continue to show economies in coal through greater achievement in the production of gas per ton; and this does not apply only to the larger works. Despite the croaking of a few years ago, as to the tribulation that would follow the considerable adoption of modern methods and mechanical operation, half year by half year the testimony comes of increased production per ton and reduced manufacturing costs at works the managements of which have been not madly but rationally progressive in their modernizing ideas. Liverpool, Derby, and Ipswich may be quoted as places where the Chairmen of the Companies have acknowledged in recent weeks the advantage that is being reaped from the introduction of latter-day methods. Many of the provincial works at present are engaged on extensions and improvements; for increasing demand will allow little pause. The South Shields Company are among those who have been making works changes; but the retort plant at their Jarrow works has been patched up sufficiently to last a year or two, as (and this is the interesting point) Mr. T. H. Duxbury has reported favourably upon the prospects of vertical retorts. A waiting policy is thus the result. The annexation of new ground, and the carrying of feeders into new areas, have been industriously carried on from various gas centres. All

this activity means expenditure, and has necessitated the creation and issue of further capital at several meetings. At every point of observation, prosperity and unimpaired vitality are presented; and thus there is good cause for supreme satisfaction.

An American Address—The Tar Question.

If the presidential address of Mr. William M'Gregor to the New England Association of Gas Engineers (which we publish to-day) had been prepared for a British Gas Association, it could not have been more appropriate in matter and style. It was pregnant with feeling, with appeal for the individual recognition of high responsibility, with reasoning motive for the grasping of opportunity to the full, and with argument for the need of co-operation to secure the ultimate advantage from that which comes to hand in the operations of gas manufacture and supply. Mr. M'Gregor is no idealist. His view is along practical lines; his ambitions and objects are the result of the selection, by careful observation, of the experiences in the great gas-supplying countries of the world. But in so characterizing the matter of the address and the man, let it not be inferred that the gas managers of New England or of the United States generally are not alive—aye, keenly alive—to their business, or that the President was setting himself on an intellectual pinnacle above his fellows. There was no charge of lethargy; no indication of egotism. But if the gas manager of America has one attribute stronger than any other, it is in the energy he displays in the commercial development of the gas side of his business. There is a beyond; and it is in that region that there is valuable contribution to be obtained to the strengthening of position in the chief part of the business of a gas undertaking, and in which part adroitly directed competition (in America as here) has to be met.

It is in the residuals branch of the American gas business that, it is evident, Mr. M'Gregor is of opinion there is room for greater industry and co-operative activity. American gas undertakings, as do those in this country, suffer from low tar values. Perhaps there will be consolation here in knowing that American gas managers share in this affliction. However that may be, we must join issue with the President over his assertion that the tar business has not been affected for the better by the discoveries of Sir William Perkin, though contrary views are held by some of the best friends of the industry. The law of supply and demand must be considered. Supply in the gas industry alone has multiplied exceedingly during the last half century; and that supply is hugely supplemented from other sources. Had there not been the demand resulting from Perkin's discoveries, the managers of the gas industry might have had, at the present time, the additional responsibility hanging upon them of finding decent and unobjectionable burial places for their tar surpluses. We quite agree that the gas industry is not receiving the value it ought to do for a product containing such concealed richnesses. The mere fact, however, that the mending of the position is sought by finding new outlets to shorten the supply to the tar-colour industry, and so to improve prices, is the proof of over-production—an over-production that is inevitable owing to the prosperity of the industries yielding it as a residual. It is no use railing against the unavoidable; the best thing is to confine attention to the cultivation of new markets for the tar—to try to so establish it for fresh purposes that it will be an absolute essential for new industries. Mr. M'Gregor has taken stock of what is being done over here; and the use of tar for the improvement of road construction or for the betterment of the surfaces of existing roads commends itself to him. But we are not quite so sanguine as the President that success in this particular use will completely emancipate the gas manager from further tar troubles; it will only assist to that end.

While we are on this point of tar utilization, the hope may be expressed that readers of the "Journal" will not overlook the competition, under the auspices of the Roads Improvement Association, for the best preparation of tar suitable for road purposes. Entries cannot be made later than the last day of the present month; and we do hope that the gas industry, whose interests are so deeply merged in this question, will not be guilty of indifference to strong representation in this competition, and to the doing of all possible to encourage the work that is being prosecuted to promote the extended use of tar by road authorities. The results of this competition will be circulated far and wide; and there is not the slightest doubt that a great trial will be made of the tar preparation that is adjudged the superior in fitness. Information regarding the competition was published in the "Journal" for Feb. 12 (p. 399), and the subject is again referred to elsewhere to-day.

In addition to this new outlet for tar for road purposes, there is the question of briquette-making; but this Mr. M'Gregor does not mention. There is also the prospective greater absorption of tar, or rather the restriction of output, within gas-works themselves, by the change in carbonizing operations to vertical retorts or to inclined retorts charged full almost to the top, as Mr. Love is doing at Guildford in his trial 45° inclined retorts, interesting results from which were published in the "Journal" last week. This, however, refers to the future; and the day is far hence when the catholic carbonizing methods of to-day will have disappeared among the victims of progress. Therefore, Mr. M'Gregor carries his inquiries into possibilities for immediate improvement of the residuals business; and the outcome is advice for the co-operation of groups of undertakings in the provision of common plants for the working up of the bye-products. The idea is not a new one. Theoretically it looks well; but, as a practical proposition, it has not found any great favour. Self-interest steps in; and mistakenly or otherwise, the liking for "paddling one's own canoe" overrides, among Directors and Committees, the advantage of co-operation. This liking for direct dealings with products is understandable; but that it is always wise is another matter. The bye-products of gas manufacture are highly valuable; and, as the President says, the need is great for turning them into as much ready cash as possible. To do this, loyalty to conventionality may not always be the best course, unless local circumstances are propitious. Mr. M'Gregor's plan of common plants for the working up of residuals, too, might not in cases be so advantageous as the pooling of outputs for sale. There are many things to be taken into account in this matter; and they must be examined from the point of individual circumstance.

Sound views are expressed in the address on the subject of low illuminating power gas, Sunday rest, vertical retorts, and municipal ownership; and we are glad to have the figured testimony as to the expansion and prosperity of the gas industry in New England. It is singular how universally similar in these competitive times are the experiences of the gas industry.

Labour and Public Protection.

The *coup de surprise* of the electrical workers of Paris (to which allusion was made in our last issue), which deprived Paris of electric light and energy from the Friday till the Saturday night of the previous week has, through a debate in the French Chamber, exposed yet once more the selfishness and the tyranny of Socialism. The doctrine has been propounded that the liberty of the proletariat must ride supreme, even above the security of a great community like Paris. It appears that the men at the electric light works came out on strike not on account of existing conditions, but to compel obedience to their desire that, the electricity concessions being about to expire, the new ones should contain a stipulation for an eight-hour day, so as to place the men on the same footing as the municipal employees and the gas workers under the new *régime*. For this, the security of Paris and of the citizens was jeopardized. The disparity between the cause of the strike and its effect and dangers shows conclusively the iniquity of the means adopted to obtain the desired adjustment of the working conditions. But in the French Chamber, one of the Socialist leaders actually defended the action of the men, and rated the Prime Minister for having, in the exercise of his common sense, taken the initiative in ordering sappers to Paris to fill the place of the strikers. Socialists do not care how much injury they inflict on other people, but are frightfully thin-skinned when their own interests are affected. The act of the Prime Minister to relieve inconvenience, and to prevent violence, pillaging, and possibly worse, was resented as removing one of the rights of workmen. Thus we have it laid down as a socialistic principle that a right exercised by a few hundred men ought not to be infringed by a Government offering protection to a whole community by the restoration of a public service. It is almost too ludicrous to be treated seriously. The Socialists either cannot, or will not, realize that anything is a public service that is not under Municipal or State

administration; but it is a good thing for Paris that the head of the Government entertained different views.

Such a sudden disturbance by labour of a public supply of light as this strike in Paris occasioned could not happen in this country. There was an attempt to put London in darkness in the winter of 1872, by strikes at London gas-works; but, as many pages of information in the "JOURNAL" at the time show, the strikers did not succeed in their nefarious purpose, and the arm of the law was long enough even then to give some of the leaders in the strike their deserts. Since then the Conspiracy and Protection of Property Act, 1875, has been passed; and section 4 provides against any breach of contract by persons employed at gas-works. We hope that the tampering with this Act that was commenced in the Trades Disputes Act of last session will not be carried further. It may also be hoped that the French Government will profit by the lesson of the Paris strike, and ensure that no community is again placed in similar predicament to that of the capital.

Apart from what the Government may do, householders and those responsible for the management of large institutions—public, industrial, and otherwise—have it within their power to provide against being made the victims of a surprise of this kind, through labour or accident, by adopting a dual system of lighting. The "Financial News" has referred to this matter. In the opinion of our contemporary, if Paris had been able to fall back temporarily upon gas lighting, "the men would very probably not have gone out, "and, in any case, they would not have been able to do much "mischief." It is added that "accidents to electric plants are "so frequent, and one is so much at the mercy of the men "employed on them, that it is not safe for any city or any "large institution to neglect the precaution of having an "installation of gas as a stand-by in case of emergency." This is the view of a paper that can certainly in this matter be taken as being perfectly disinterested. We understand that in Paris the owners of several cafés and other public resorts are already moving to obtain protection in the practical manner suggested.

The Mysterious (?) "Coalite."

AT intervals, for several months past, our attention has been called to the movements of a Company who are seeking to establish themselves under the not very informative title of "Coalite, Limited." What is "Coalite"? and "Is it true "that it is likely to affect the gas coke market?" inquisitive correspondents have asked. The particulars that we have been able to afford on the first-named point have been meagre, but quite sufficient to give quietus to the fantastical notions that certain receptive minds had imbibed. As to the second question, there need be little fear on that head. When, in the early part of the year, the question of "Coalite" was brought to notice with a little more frequency than previously, we naturally made inquiries direct of the Company; were politely received, but were told that they were not then prepared to publish any information, and when they were, they would communicate with the "JOURNAL." We have waited patiently, but in vain, for the promised communication. The reticence is suspicious, and presents a very weak feature of this singular promotion, with which those who are wise will have nothing to do until the promoters disclose precisely what it is they have in their hands. Fortunately, the offices of the Company did not exhaust the channels of information.

The subject has been brought up again in a letter just published in the "Manchester Courier" by Sir William H. Bailey, who (as will be seen from the quotation given elsewhere) refers to "Coalite" as the product of "an in-"genious and absurdly simple process," which, in Sir William's opinion, is "one of the most amazing inventions "of this generation." There is little doubt about it being an absurdly simple process, although it has required (if our investigation is not at fault) five or six patent specifications to describe it, but which specifications, for some unaccountable reason, though the applications were made months ago, are not yet procurable. Peradventure, the delay in publication has been brought about intentionally, in order to debar the inquisitive from obtaining too much information while the rumoured manœuvring in the City under the banner of "Coalite" is carried to successful issues.

At the bottom of this "absurdly simple process" and "most amazing invention" is our old friend "charred" or partially carbonized coal, of which so much was heard at the Smoke Abatement Conference towards the end of 1905; about which Mr. W. D. Scott Moncrieff contributed a special article to our columns on Jan. 2, 1906, but whose contentions were torn to shreds by Mr. Samuel Glover in the succeeding issue; and about which there have been occasional reports from Germany. The smokeless fuel "Coalite" is to be made from small coal; and, after partial carbonization, it is understood (but as to the accuracy of this, for the present we cannot vouch) that it is subjected to some secondary treatment, which will remain a secret until the patent specifications are issued. If this further treatment has any reality at all, we are prepared to find that the whole process is emphatically entitled to the description of "absurdly simple" with which Sir William Bailey soberly honours it, and that it is its absurd simplicity that prompts the promoters of "Coalite, Limited," to keep information from those who might, through the light afforded, burst the bubble that is apparently being successfully blown among the good-natured smoke abolitionists and other men whose names in industry stand for integrity, but who have been fascinated by the process, or by the pretty web of possibilities that has been woven around it. If "Coalite" has been subjected to technical investigation—and, of course, it has been—we do not think all the reports can have lauded the process and product as commercially practicable. From all of which, it will be gathered that we do not look to "Coalite" being a formidable competitor with gas coke, or for the matter of that with coal; for it may be fairly conclusively asserted that the heating value of "Coalite" (Dr. Grossmann, it will be seen elsewhere, mentions this point) cannot be, weight for weight, equal to that of the original coal. Further, it is certain that the large proportion of volatile matter that the material contains will render it totally unfit for metallurgical purposes. Again, we are not anticipating that the demand for "Coalite" will be so great that such a quantity of residual high-power gas will be produced that many gas companies will be able to contract for it at ¼d. or ½d. per 1000 cubic feet, as some of the printed disseminators of sensation have stated—though not altogether solemnly, be it said to their credit, for this is too much of a "fairy tale" even for them.

The Law as to Debentures.

In view of the fact that no action had been taken by the Government to give effect to four of the recommendations of the Board of Trade Committee on Company Law Amendment with reference to debentures, Lord Avebury introduced a Bill with this object; and it was read a second time last Tuesday week. His Lordship's action stirred up the Government, for Earl Granard brought in a Bill two days later. The matter was urgent in consequence of decisions recently given by the Courts, which were entirely opposed to what had generally been regarded as the law with respect to debentures. This was stated clearly by Lord Avebury when moving the second reading of his Bill. He said it had always been assumed that, if a company had a right to issue (say) £1,000,000 in debentures, they might, if they had a surplus of funds, pay off some of them, and re-issue them when they could employ the money in their business—always provided that the legal maximum was not exceeded. It had now been held, however, that debentures so purchased or redeemed were *ipso facto* cancelled, and could not be re-issued, and that those which had been so re-issued were no better than waste paper. His Lordship pointed out that this was a serious position for companies, and still more for the public, because no one who held any debentures or debenture stock could tell in such cases whether his security was good or bad. The measure introduced by his Lordship is a very short one. The first clause removes the doubts which exist as to the validity of provisions commonly inserted in mortgage debentures and debenture stock securities, purporting to make them perpetual or irredeemable, or redeemable only at the expiration of a long term of years or in the event of contingencies which may never happen. The second clause is intended to bring the law into accord with what has hitherto been the common practice. The third clause relaxes, as regards companies, the antiquated rule that in creating a mortgage it is not competent to the mortgagor and mortgagee to arrange that the latter shall have the option of purchasing the mortgaged premises. The fourth gives the Court jurisdiction, which it does not have now, to order specific performance of a contract to subscribe

for debentures or debenture stock. The object of the Bill introduced by Earl Granard is "the affording of information to all who may seek for it concerning companies registered under the Companies Acts;" and (*inter alia*) it will remove doubts as to the validity of perpetual debentures and debenture stock, and enable a company to give an option of purchase to a mortgagee of its debentures, and keep alive and re-issue debentures which have been redeemed. These matters are covered by clauses 15 to 17; and clause 18 enables a contract to take debentures to be enforced by an order for specific performance, just as if it related to shares. It will thus be seen that the Government Bill incorporates the proposals contained in that of Lord Avebury. The latter, however, is the more simple, is in accordance with views expressed in City circles, and has the support of the Institute of Chartered Accountants, the Stock Exchange, the Insurance Companies, and the leading bankers and merchants. Lord Avebury does not, it appears, intend to abandon his Bill. He thinks, indeed, that it will be allowed to go through, and that the Government measure will not be pushed this session.

Australia and Old-Age Pensions.

At the present time, when there is renewed talk of some kind of provision being made by the State for aged persons in this country, and the method by which this might be brought about is matter for speculation, it may be of interest to refer to the report just issued of the Royal Commission appointed in 1905 to inquire in Australia into the working of the Old-Age Pensions Acts of New South Wales and Victoria and the probable cost of, and best means of establishing, similar pensions throughout the Commonwealth. The report is favourable to the provision of such pensions, which it is recommended should be paid out of the consolidated revenue; the German system, under which employers, employees, and the Government jointly contribute towards an old-age pension fund, being held to be not practicable in Australia, owing to the widely divergent conditions of the two countries. The Commissioners estimate at £1,500,000 per annum the cost of the following scheme for the Commonwealth; and they recommend the early preparation of a Bill to carry it into effect. The pension, it is proposed, should be fixed at a maximum of 10s. per week; the qualifying age to be 65 years, reducible to 60 years where an applicant was permanently incapacitated for work. Payments should be made fortnightly through the Post Office; the general administration of the scheme being placed in the hands of a Commissioner responsible to a Minister of State. To qualify, the applicant should have been continuously resident in the Commonwealth for 25 years (with absences not exceeding a certain total time). With this condition fulfilled, all natural-born British subjects of a white race, and naturalized persons (excluding aboriginal natives of Australia, Asia, Africa, or the Islands of the Pacific) would be eligible, within the limits of means proposed. Pensions granted would be subject to review, amendment, suspension, and cancellation at any time, and special provision would be made for dealing with persons of "disreputable or intemperate" habits; while there would be power to compel relatives, if in a position to do so, to contribute in all cases the amount of the pension. The yearly income of a pensioner from all sources, inclusive of pension, should not exceed £52 per annum; and the deduction on account of income from other sources should be £1 for every pound over £26 per annum. The net capital value of accumulated property held by an applicant should not exceed £310; while the deduction on account of property should be £1 from pension on every £10 of net capital value over £50, excepting where the property of an applicant consisted of a house in which he permanently resided, and which produced no income, when an exemption of £100 should be allowed. The last recommendation of the Commission, however, would, there is reason to fear, be not altogether popular in some quarters. It is: "That a penalty should be imposed for supplying an old-age pensioner with intoxicating drink."

The Rateable Value of London.

Under an Act passed in 1869, it was made compulsory, as our readers may remember, to have every five years a revaluation of the property in the Administrative County of London. In this respect, it stands alone among the counties of the kingdom. The first valuation was made in 1871, when the rateable value of property was put at £19,963,285. Since then seven valuations have been carried out; the result being that the value has been raised to £43,486,437. The increase in the thirty-five years has, therefore, been £23,523,152, or 117·83 per cent. According to a return recently issued by the Statistical Officer of the London County Council (Mr. E. J. Harper), £14,309,600 of this amount may be said to represent the building growth in the period named, while £9,213,552 may be attributed to the increase in the value of land. In other words, the rise in respect of land value alone represents nearly half of the total rateable value (land and buildings) of London in the year of the first valuation. The estimated quinquennial increase from re-valuation has varied in amount from £1,702,338 in 1881 to £684,885 in 1886. The average estimated increase for the seven re-valuations is £1,316,222; and the increase at the last just exceeded this sum. The changes brought about by the Local Government Act, 1899, resulted in a loss of £69,686 in 1901; and other slight variations of rateable value, due to minor adjustments of the county boundary, have taken place. With reference to the two industries with which the "JOURNAL" is identified, the statistics show that in 1900-1 the rateable value of the gas undertakings in London was £923,924; whereas in 1905-6 it was £896,742—a decrease of £28,182, or 3·06 per cent. The value of water supply undertakings in the former year was £634,206; and in the latter, £684,584—being an increase of £50,378, or 7·94 per cent. These figures are as nothing compared with those for the electricity undertakings, inclusive of those under the control of the Municipalities. In 1900-1 their rateable value was £202,729; whereas in 1905-6 it was £379,083—an increase of £176,354, or 86·99 per cent. The rateable value of all the undertakings last year was £4,812,748; representing 11 per cent. of the total rateable value of London.

OBITUARY.

The death occurred with painful suddenness on Sunday, the 10th inst., of Sir DANIEL DIXON, a prominent citizen of Belfast. He left his house, near Holywood, in the morning to attend church, and was taken ill on the way. He, however, succeeded in reaching the residence of his son, where he succumbed to heart failure. Deceased had been seven times Mayor of the City, and was for more than three years Chairman of the Gas Committee of the Corporation.

We regret to record the death, last Tuesday morning, in his 77th year, of Mr. SAMUEL HORNBY, the Chairman of the Harrogate Gas Company. He became an Auditor in 1865, was appointed a Director in 1872, and since 1896 had been Chairman. He attended a meeting of the Company on the 7th ult., but had of late been in a very weak state. Deceased took considerable interest in the prosperity of Harrogate, and was on the Committee of the Infirmary and a Governor of the Royal Bath Hospital. He leaves two daughters. The funeral took place on Thursday, at Harrogate Cemetery, and among the numerous attendance were several of the Directors of the Company, the Secretary and General Manager (Mr. Harry Wilkinson, who is one of the Executors), members of the staff, and public officials.

Another Welsbach Invention.—A correspondent of the "Pall Mall Gazette" states that Baron Auer von Welsbach has perfected another invention, which is claimed to have great military value. It consists of a combination of cerium and iron, of such a highly sensitive nature that the lightest touch will cause sparks to fly. For artillery and explosive purposes generally, the new invention is believed to have much importance. Baron Auer is reported to have sold his rights in the new discovery to an American Syndicate for £125,000.

Management Changes at Ramsgate.—We learn that Mr. T. N. Ritson has resigned the position of Gas and Water Engineer to the Corporation of Ramsgate, in order to become London Manager to the Pelaw Main Collieries and Birtley Iron Company. Mr. Ritson succeeded Mr. W. A. Valon at Ramsgate in July, 1902. He had previously been for ten years at Kendal, to which place he went from Jersey, where he was Assistant Engineer and Manager of the Gas-Works. At the meeting of the Gas and Water Committee of the Corporation last Friday, a resolution was passed tendering their best thanks to Mr. Ritson for the valuable services he had rendered, and recording their appreciation of them. Another resolution was passed appointing Mr. George Cockburn (the Accountant) Secretary of the gas and water undertakings, at a commencing salary of £400 per annum; and approving of the draft advertisement, inviting applications for the position of Engineer and Manager, which will be found in another part of the "JOURNAL." Mr. Ritson has made many friends at Ramsgate; and all will, we are sure, unite with us in wishing him success in his new position.

NOTES FROM WESTMINSTER.

ALTHOUGH Committee work had a modest start during the preceding week, it was last Tuesday morning that the first Gas Bill made its appearance before a Select Committee; and the one to be taken by Sir Frederick Banbury's Committee was that of the Annfield Plain Gas Company. The Mitcham and Wimbledon Gas Company's Bill followed; and, besides Unopposed Bills, these were the only ones considered through the week. Lords Committees were sitting; but their attention was riveted on matters referring to traction. Opposition has been allayed in connection with quite a number of Bills—among others the Falmouth and Maidstone Gas Bills. The Surrey County Council have also withdrawn their opposition to the Mitcham and Wimbledon Bill. It is going to be a flat session for both the Parliamentary Bar and other professional gentlemen who practice at Westminster. There will be further loss for some of them now that Metropolitan industry has been relieved of the aggression of Progressivism. But electrical affairs of the Metropolis will again this session help somewhat to fill an "aching void."

Honourable and Dishonourable Promotions. There have been in the past privately promoted Bills before Parliament to confer powers on companies of very doubtful origin. Some of them have got through without the promoters being, however deservedly, bespattered with mud; and no one has appeared to properly guard the interests of consumers nor those of the investing public. The promoters of the Bills have parted with the property they held and the statutory rights they obtained at their own valuation—in most cases, a valuation which will ever be an incubus on shareholders and consumers alike. If there had been adequate representation against such promotions, they might have been properly dealt with by Parliament, and the consumers and public might have been protected. But in dealing with new promotions, there should be discrimination—discrimination justly founded. For if not, districts poverty stricken in the matter of gas supply may for ever go derelict, or fall into the hands of less honourable promoters than those of the Annfield Plain Gas Company, whose Bill was before Sir Frederick Banbury's Committee last week. The promoters of the Bill are Messrs. Schultz and Comins, with whom, among others, is associated Mr. W. C. Parkinson. These gentlemen stand in the best repute in the gas industry; and their connection with it bears no dishonourable stain. There were points in the Bill, as there are in most Gas Bills, that were open to controversy and modification; but it cannot be said that the promoters in any way showed that they were not amenable to reason and to concession. The provisions of the Bill and the persons promoting, were quite distinct. The provisions were up for judgment, and not the persons. Therefore it is to be regretted that much that fell in the Committee Room last Tuesday and Wednesday was uttered. Certain words have common meanings; and, whatever may be the intention behind them, once used they do harm and give personal pain. Mr. Honoratus Lloyd took a dignified course in merely uttering a protest, on behalf of his clients, and refraining from further comment. It is dishonourable, and not honourable, promotion of Companies in the gas industry that it is desired to stop; and the view of the Committee on this head is reflected in their declaration that the preamble of the Bill was proved.

Points in Dispute. Let us look at the position. The district proposed to be supplied, including Annfield Plain and Tanfield (we omit Medomsley, as it was removed from the Bill), has been dependent upon two small gas-works, at West Kyo and Dipton, which the promoters of the Bill have acquired, and the supply from which they have done something to improve, pending greater reconstructions and alterations. Complaints as to the supply of gas in the district have been as loud as they have been long; but, beyond calling the attention of those who previously ran the works to the complaints, the District Council have—their own Clerk freely acknowledges—not moved themselves to remedy this state of things. The previous owners of the works were willing to dispose of their undertakings. The Council did not buy; but Messrs. Schultz and Comins, as a straightforward business venture, did, with the view (which is the object of most business transactions in property) of causing the investment to pay them by making good deficiency and producing development. The District Council refused to allow them to continue to open the roads for improving the distribution system, which, the district being a colliery one, was greatly needed. The promoters therefore came to Parliament for statutory powers, and with a view to the formation of a Company to take over the works, and develop the business generally. In the Bill is an innovation in the shape of a proposal for arbitration for the determination of the price at which the works are to be taken over from the promoters. The scheduled agreement provides that the basis of arbitration shall be "the fair value" of the land and property and of the gas-works as a going concern—the purchase price to be satisfied by the issue to the owners of fully-paid shares. The proposition seems to be a far better plan than the arbitrary and astounding fixtures of values which promoters have themselves put upon gas undertakings in recent prospectuses. If the plan of arbitration in the circumstances will suppress plundering, then it should be welcomed rather than reviled—more especially in this case, as the promoters were willing, and Sir Frederick Banbury's Committee have ensured this, that the District Council shall have the right of representation at the arbitration, with access to books and documents. A better means of defending the interests of the consumers and the public was not advanced by the opposition, though objecting to the arbitration clause. Both from the promoting and opposing sides, there was abundant evidence as to the miserable state of the works, and the supply of the district generally; and so the sooner the Company are able to get to work to set their plant and the supply in order, untrammelled by a lethargic and obstructive local authority, the better. There was a great deal of discussion about the capital asked for, the question of maximum and standard prices (the promoters preferred the latter, but a maximum price of 4s. 6d. had found its way into the Bill), the question of dividends to be paid, and the question of the possible rate of increasing consumption (which is positively an unknown quantity under the circumstances). The capital, maximum or standard price, and the dividend were fair marks for attack; and, in the result, the proposed capital of £45,000, with one-third borrowing powers, was reduced to £36,000, with one-third borrowing powers; the maximum price of 4s. 6d. was altered to a standard price of 4s., with a standard dividend of 7 per cent.; and the maximum amount of the Directors' fees was fixed at £200 per annum. The District Council did not appear on clauses; so that it may be taken that they are proposing to renew their attack in the Lords. Among the witnesses called by the promoters (in the order examined) were Mr. E. H. Stevenson, Mr. W. C. Parkinson, and Mr. H. E. Jones; while Mr. Corbet Woodall and Mr. William Hardie gave evidence for the District Council.

Mitcham and Wimbledon Settled. Sir Frederick Banbury's Committee made a short week of it—following the precedent set in the Commons last year—by not sitting on Friday. We hope this is not a practice that is going to be adhered to under the new *régime* at Westminster. It protracts proceedings on Bills; and if the measure before the Committee at the break of the sittings on Thursday afternoon happens to be one from the Provinces, it means a great waste of time for the witnesses brought up to London, and also additional expense both for promoters and opponents. On this occasion, it is the Mitcham and Wimbledon Gas Company's Bill that was before the Committee when they concluded their sittings for the week on Thursday, so that, as all engaged on the Bill are conveniently situated for attendance at Westminster, no harm was done—perhaps in the event good resulted. There promised to be a fairly big fight over this measure; but the concluding words of Sir Frederick Banbury at the close of Thursday's sitting—to the effect that an agreement as to standard price and testing might facilitate matters—evidently made an impression upon the parties, for they came up yesterday morning with certain proposals which enabled the Local Authorities to relieve the Committee of their presence. But it was a big fight that was contemplated; and there will be few Gas Bills this session that will have greater professional representation before a Committee than this one. The Company were represented by two K.C.'s—Mr. Balfour Browne and Mr. Honoratus Lloyd—and two juniors, one of whom Mr. C. C. Hutchinson ranks as a junior only because he has not aspired, for very excellent reasons, to be arrayed in silk. The London County Council, who had really little right to be present, were represented by a K.C. and a junior; the former being Mr. G. J. Talbot, who was the quondam junior—always alert, careful, and courteous—in many a gas fight with Mr. Freeman, K.C., as leader on behalf of the County Council. The Croydon Rural District Council and the Wimbledon Corporation had two wearers of silk representing them—the Hon. J. D. Fitzgerald and Mr. E. F. Vesey Knox—the latter of whom, like Mr. Talbot, has made the advance in his legal status since his final appearance before Parliamentary Committees last session. The Wandsworth Corporation and a private petitioner were also represented. If the legal element was strong, so also was the backing rank of gas experts. For the Bill, there were Mr. Corbet Woodall, Mr. H. E. Jones, Mr. E. H. Stevenson, and Mr. B. R. Green, the Company's Engineer. While supporting the opposing local Councils were Mr. Charles Hunt, Mr. W. A. M'Intosh Valon, and Mr. William Cash, F.C.A. Now as to the terms which satisfied the Councils, we will only briefly state them here. First, as to the standard price. In the Bill, this originally stood at 3s. 9d.; then the Company came down to 3s. 6d.; but, under the agreement, they forego another 4d.—making the standard price 3s. 2d. The additional capital originally asked for was £300,000 ordinary, with one-third borrowing powers—£400,000 in all. Of this total, £80,000 has been relinquished—the ordinary additional capital now being £240,000 with one-third borrowing powers, or £320,000 in all. The Company have conceded a testing-place in the borough of Wimbledon; this being subject to final arrangement between the parties. Then from the Bill was eliminated the variation that it was first proposed to make in the ordinary testing clause, as to not being subject to penalty unless the deficiency of the prescribed illuminating power was shown by the average of three consecutive tests made in any one day at intervals of not less than one hour—this being in accordance with the provision applying to the Metropolitan Companies, but not outside London. The testing clause also provided for the use of the bar photometer or the table photometer. The option has been abandoned by giving up the table photometer. The South Suburban clause relating to calorific value and flat-flame

testing without penalties has been incorporated, so far as it is applicable. It has been agreed that mains shall in future be laid at a depth of not less than 2 feet; and in regard to private streets, the Company are to submit plans to the Local Authorities for their approval as to position. Then it has been provided that the renewal and insurance funds shall be calculated upon the actual paid-up capital, and not upon the increase owing to conversion. The prepayment clause limiting excess price is also to be inserted in the Bill. The Local Authorities have not got all they asked for, but have certainly got a good slice.

The Half-Candle Margin. It is understood that the Lord Chairman has declined to accede to the proposed incorporation in the Llandrindod Wells and Annfield Plain Bills of the clause allowing a half-candle margin below the prescribed illuminating power before a penalty can be imposed. We drew attention to this clause in an "Editorial" on Jan. 1 (p. 14). The clause has precedent in the Acts governing the testing of gas in the Metropolis and in the district of the South Suburban Gas Company. There appears, therefore, to be no reason why it should not be extended. If it is not to be allowed in future, then there is further reason why the prescribed—not necessarily the supplied—illuminating power should be pushed farther down, say to 13 candles, as was done in various cases last year.

Unopposed Bills: Interesting Points. The Unopposed Bills Committee of the Commons were engaged on Thursday in considering several Gas Bills which have been either unopposed from birth or else have undergone settlement. The Gas Companies (Removal of Sulphur Restrictions) Bill was one; and it goes forward in the form introduced. The Llandrindod Wells Gas Bill was another. This is the peculiarly interesting Bill which reverses the ordinary condition of things by proposing to introduce a supply of gas into the district of an Electric Lighting Company. The experience has hitherto been uniformly the other way about. The Electric Light Company were at one time opponents; but they thought better of their proposed mission to Westminster. Possibly the fact that the ratepayers are favourable to having a choice of illuminants, stayed the Electric Light Company's eagerness to stop the proposed invasion of the territory that they occupy. The Company have made certain concessions to the Corporation—one or two of rather a novel character. One of them binds the Company not to supply carburetted water gas or Dowson gas [why "Dowson" and not the generic term "producer"?] at any time without consent of the Council. During the discussion on the Bill, it also transpired that the Local Government Board have made a change in the model clause referring to the supply of gas in bulk in outside districts, by which change any outside Council who may be also electric light suppliers, will be prevented from acting the part of "dog in the manger." That is an excellent and useful amendment. A further point that was raised on this and on another Bill referred to the excess charge for prepayment meters without fittings. The last revised version of the prepayment clause suggests 10 per cent. on the cost of the meter. Some Bills have retained the old sixpenny excess. The sixpence is about as near as anything can be to the 10 per cent; and it is vastly more convenient as a matter of calculation and account. The Basingstoke Gas Bill also passed; and so did the Bude Bill. It appears, however, that the ordinary capital in this case has been reduced by agreement from £15,000 to £8000; and the proposed maximum price from 5s. to a standard price of 4s., with sliding-scale. This Bill is one of the three to

Testing Clauses. which we called attention in our editorial columns on Jan. 1 as specifying (notwithstanding the new model testing clause) a "London" argand No. 1 burner for testing 14-candle gas! When the testing clauses were reached, Sir Chandos Leigh (the Speaker's Counsel) remarked: "Then, as to the testing clauses, we have not finally settled yet." Mr. E. Herbert Stevenson replied: "The testing clauses are not yet finally settled for any Gas Company." This notwithstanding the model clause and recent years' legislation. The reply calls to mind the report Messrs. Stevenson and Burstal recently made to the Falmouth Corporation in which they said (regarding the proposal of the Falmouth Gas Company to substitute the "Metropolitan" argand No. 2 burner for the "London" argand) they should not advise opposition to the "Metropolitan" No. 2 burner, because "it is the only known burner which shows the actual illuminating power of the gas, *and in a very short time it will become the common standard burner for all gas companies.*" This looks as if Mr. Stevenson's settled conviction had a temporary interruption last Thursday. The Falmouth Gas Company's Bill was also one that passed the Unopposed Bills Committee.

Reference (*ante*, p. 144) has already been made in our columns to the Census of Production Act. It has now been announced that the President of the Board of Trade has appointed a Committee to advise upon the general scope of the census and the lines upon which the information required shall be obtained. Other Committees, who will consider the special requirements of particular trades, will shortly be appointed, consisting of leading manufacturers and nominees of their Associations. The names of those who have consented to serve on the General Committee, in addition to the official members representing the Board of Trade and the Home Office, are: Lord Allerton, Lord Avebury, the Right Hon. Charles Booth, Sir Hugh Bell, Bart., Mr. Henry Birchenough, C.M.G., Sir Robert Giffen, K.C.B., Professor Chapman, and Mr. Sidney Webb.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 769.)

A WEEK ago we characterized the dealings in Wall Street, New York, as "almost unexampled." But since that date, things went from bad to worse, and operations became absolutely unexampled without any qualifications. There is no need to dwell on the subject; for the Daily Press has been full of it, and many innocent victims on this side of the Atlantic are but too painfully aware of it. Only in its effect on our markets does it concern us; and that effect was most disastrous. On the opening day, the Stock Exchange was calm, as there appeared to be a lull in the American Market; but a secondary result of the disturbance was apparent in the gilt-edged market, and Consols had a sharp fall. This was repeated the next day. A further fall came on Wednesday; and prices in general tumbled down like ninepins. The crisis came on Thursday, when Consols touched 84¼—a record minimum for many years. From this point there was a very slow and timorous recovery, aided by a few bold buyers who came in to snap up bargains. Meanwhile, the settlement of the fortnightly account had wrought five failures, and more were feared. However, no more were announced; and this caused a less tempestuous closing. In the Money Market, there was a good demand for short loans; and discount rates were firm. Business in the Gas Market was no more than moderate; and towards the close it tailed off very quiet. In a week so disastrous to many unexceptionable securities, no surprise need have been felt if gas stocks had suffered with the rest. But the falls in our quotations, although they outnumber the rises, were neither numerous nor severe. In Gaslight and Coke issues, the ordinary remained perfectly firm and steady, with transactions which ranged from 95½ to 96¾. The secured issues were scarcely touched. The maximum was done once at 88; and the debenture at from 83½ to 84½—a fall of a point. South Metropolitan was more freely offered, and after marking 123 fell to 120½; but it afterwards reached 122 again. The quotation was put down 2½. Commercials were very quiet, with one bargain at 109 in the 4 per cent., and one in the debenture at 84½. Among the Suburban and Provincial group, Bournemouth "B" changed hands at 16⅞, Brentford preference at 120, British at 43, Lea Bridge at 123¾ *cum div.*, South Suburban at 120, Tottenham debenture at 101 free, Wandsworth and Putney "B" at 138¾ and 139 (a fall of 3 points), ditto debenture at 79 free, and West Ham at 103. Of the Continental Companies, Imperial was a point lower, with dealings at from 180 to 178, European fully-paid half-a-point lower, at from 24⅞ to 24¼, and Union 1 lower without business being done. Among the undertakings of the remoter world, Bombay was done at 7, Buenos Ayres at 11⅝ and 11¾, Primitiva at 7 15/16 and 7¾, ditto preference at 5 3/32, River Plate at from 12¼ to 12¾, San Paulo at 13⅛, Cape Town debenture stock at 96½, and South African at 16 1/16.

The closing prices are shown in our list on p. 769.

ELECTRIC LIGHTING MEMORANDA.

A New Prophet and Buoyant Hopes—Disaster Predicted for the Gas Industry—Strength of the Gas Business—Manchester's Honour—Electricity Supply in London—Train Lighting and Accidents.

THE intrepid writer in the "Electrical Times" who was lately foreshadowing "disaster sharp, sudden, and complete" for the electrical industry, if a really good one-watt-per-candle metallic filament lamp finds its way into practical service under the delimiting conditions of electricity supply in this country, has found that antagonistic opinion obtains in many places—especially in Blackpool. Mr. Charles Furness, the Electrical Engineer at that salubrious seaside resort, has sent a long letter on the subject to our contemporary; and, after reading the letter, we cannot help thinking that the lightsome conditions of Blackpool must have produced a little delirium, on the point of gas and its future, in the official head of the Electricity Department. Mr. Furness thinks he is safe in saying that gas as an illuminant will shortly have reached high-water mark, and that there will be a turn of the tide. Presumably it is the metallic filament lamp that is going to cause the tide to turn, and the gas industry and the electricity industry to reverse positions. Electricity will then (so it is airily predicted) by virtue of its cheaper cost and higher qualities, be the most generally adopted medium of lighting. A new prophet is surely among us; but hailing as he does from a Corporation Electricity Department, gas shareholders are not likely to rush off to their brokers, and lighten their holdings. The prophet shows his weakness by adopting the tarnished weapon of abuse. "Gas," he says, "has fortunately for those interested in its production and distribution, other spheres of usefulness *and pollution*, which will for some time be able to maintain, *to a certain extent*, the revenues." We are obliged to Mr. Furness for the assurance that "disaster, sharp and sudden," is not going to overtake the gas industry; though about his views as to the eventual completeness of the disaster he leaves no doubt. Another effect is to be that the gas-fitting business is going to experience the stagnation that the electricity plant and fitting businesses have been suffering from so long. There is to be a complete revolution

in conditions. But the time is not yet; so that we may really breathe awhile longer.

The outlook—from Blackpool—for the gas industry is certainly a bad one. But are we down-hearted? Not a bit of it. The sober-minded among electricians are not of Mr. Furness's way of thinking. It is always prudent to be certain of one's ground before prophesying. The one-watt-per-candle metallic filament lamp suitable for voltages of 200 and upwards has yet to be found. Anticipation may precede realization; but there should always be realization before making rash statements such as Mr. Furness indulges in. He tells us that "with the adoption of the new lamp, electricity can compete with gas on price alone, apart from any consideration as regards the advantages of the superior illuminant." This shows the strength of the faith or the delusion that dwells in him. With a one-watt-per-candle metallic filament lamp, electricity would have to be supplied at less than the charge for electricity for traction purposes at Blackpool to compete with even the common "C" incandescent gas-burner (not the high-class vertical or inverted burner) "on price alone"—taking no account of the inconstancy of voltage, which does consumers' bills for electricity no good. We need not enter into other considerations here which would affect the situation; but while we are awaiting the advent of the commercially successful one-watt-per-candle metallic filament lamp, we may congratulate the managers of the electricity industry on the extent of the field upon which they will be able to work whenever the happy day arrives. The prophet of Blackpool realizes that at present electric lighting only "touches" the illuminating field in the majority of towns. He remarks on this head: "Take Blackpool, where there are over 80 miles of mains laid to supply 1060 electric light consumers, while the gas undertaking can claim 13,000 consumers on a similar mileage. Further, 60 to 70 per cent. of our electric light consumers are also gas consumers, and in many cases have gas bills equal in amount to their electricity bills—thus showing the restricted sphere of electric lighting. These conditions do not apply only to Blackpool, but to very many other electrical undertakings." The illustration shows substantial strength on the part of electricity's rival. That rival will want some killing; and British gas-fitting makers do not see anything on the horizon to cause them any feeling of uneasiness regarding loss of patronage from the gas industry. A brass-worker in the Midlands was saying the other day that his output of gas-fittings is twenty times that of electricity fittings. Mr. Furness is decidedly entertaining; but there is something of fundamental importance missing from certain of the statements to which we have called attention. Therefore, before they can receive the honour of acceptance, in part or in whole, the omission must be rectified. And when will this be?

All electrical engineers are not of the opinion that the metallic filament lamp is going to sweep everything before it. Mr. S. L. Pearce, the Chief Engineer of the Manchester Corporation, is not; nor is Mr. J. A. Cookson, the Corporation Mains Surveyor. Anyway, that is what we infer, as had their opinions been otherwise, they would hardly have been parties to the defence of an action brought against the Corporation to compel the specific performance of an agreement that was made with the Audenshaw District Council in 1900. About that time, the Corporation or the Electric Lighting Committee were very ambitious, and wanted to grab all the territory they could get. They induced the Audenshaw District Council to obtain a Provisional Order, and then entered into an agreement with them for the supply of electric energy to the district. Manchester have had experience with electricity supply since then, and have been involved in a few expensive muddles over it. This latest is in the same category. They have done nothing in the matter of furnishing Audenshaw with electricity up to the present, and now dearly want to struggle out of the agreement. To supply the district would mean a capital expenditure of from £13,000 to £16,000, with £250 for wages and £250 for maintenance; and the estimated revenue is only £200! Mr. Cookson's view, in fact, is that there "will never be a demand for electric lighting in Audenshaw." The District Council are, however, yearning after electric lighting; so that there would be some. The attitude of Manchester is all the worse, seeing that, at their instance, the District Council have in past years opposed others coming into the district; and now to themselves move in the matter would mean carrying out the work with copper at £50 per ton more than the price when they obtained their Provisional Order. The Corporation were evidently badly advised when they entered into the agreement; and all that they know now should have been found out before any signatures were appended to the document. There have been many sorry happenings in connection with the Manchester Electricity Department; and now there is another to add to the list, inasmuch as Vice-Chancellor Leigh-Clare, at the Lancashire Court of Chancery sitting at Manchester, has made a declaration that the Corporation are in default in this matter, and has made an order that they are to proceed with specific performance of the agreement. He has intimated that the arm of his Court is long enough to ensure that the order is carried out. This looks like being an unprofitable investment for Manchester; but the Electric Lighting Committee may cheer themselves up with the thought that things may not be so bad as they appear, if a really economical metallic filament lamp is found that will stand use on ordinary consumers' premises. That is one view. Manchester may, however (if they have thought anything about it), entertain the other, that the new lamps will be so economical that even £200 of revenue could not be extracted from Audenshaw.

Directorial statements, accounts, and reports of the meetings of the London Electricity Supply Companies that have recently been published, afford instructive reading. We have already referred to two or three of them; but it is noticeable from the remainder how very much the same tale runs through them. There are exceptions on all points. But the general tale is one of increased business, accompanied by increased expenditure, and in most cases the larger business has returned a smaller proportionate profit than before. The increased expenditure is attributable to several causes; but a very prominent one is the rise in the item of rates and taxes. There has been the quinquennial re-assessments; and the cry is loud and bitter as to the extra constant load this has placed on the Companies. It may be taken that the rating (we are not speaking of the rate poundage) is not in excess of what it should be; seeing that, so far as our information goes, there has been no litigation as the result of the re-assessments. But in regard to the diminution of the profits in relation to the business done, it is to be feared that some of the Companies have, in their eagerness to obtain power and heating business, exceeded rational bounds. There have been admissions made at the meetings, though not in such a plain way as is here stated, that the decline in the average profit per unit is due to this. In looking for reasons for the financial drooping in the case of the Charing Cross (West End and City) Electricity Supply Company, Limited, the "Electrician" says "the West-end power load, and a great deal of the City power load too, is admittedly not of a very profitable nature, owing to the very poor load-factor obtained." Some of it cannot be profitable at all. The pressure of the gas companies has also compelled business at lower prices. That, of course, must be expected under any competitive conditions. As a consequence of the combination of adverse circumstances, some of which have a permanent appearance, in certain instances reductions of dividends have resulted. The gloomy conditions, combined with the unsettled state of affairs electrical in London, have had a bad effect on the market price of the Companies' shares; and they have of late been in a terribly stagnant position. The Companies are looking hopefully to one result of the recent elections being the abandoning of the London County Council Electricity Bill. This would, of course, give the Administrative Company another free parliamentary innings against the existing purveyors of electricity in London. But the Companies are all hoping that their opposing co-operative scheme will succeed now that they are presenting a united front to Parliament. The ruling portion of the present Parliament is strongly inclined to municipalization; and it may be suggested to them that maintenance of present conditions, or acceptance of the Companies' joint scheme, would, if London ratepayers ever again had a taste for Progressive-Socialistic management of Metropolitan affairs, serve their policy better than giving life to a newly-created company.

The question of train lighting has been before the Newcastle Local Section of the Institution of Electrical Engineers; and we learn from a summary in the "Electrical Times" that the subjects of train fires and lighting costs were mentioned. In this report, it is stated: "The actual cost, as compared with gas lighting, is difficult to get at, because railway engineers do not measure their tractive power like the electrical people. In fact, the best way to get at the drag of the dynamo on the loco. is to go backwards and calculate it from the lamps, on the rough assumption of a 50 per cent. efficiency. On this basis, Mr. Henderson makes the inclusive cost for an eight-compartment coach £11 for electricity, £16 for plain gas, and £8 12s. for gas with mantles (he allows six mantles for 10,000 feet; and at 6d. per mantle, they cost about twice as much as the gas itself)." We do not quite understand the concluding statement. If six mantles are allowed per 10,000 cubic feet of gas, and at 6d. per mantle—that is to say, 3s. for six—they cost about twice as much as the gas itself, then we arrive at the fact that 10,000 cubic feet of the gas costs about 18d., or less than 2d. per 1000 cubic feet. This is oil gas! We are getting on. But the main point is that gas with mantles cost less than electricity by £2 8s. for lighting an eight-compartment coach. This saving multiplied by the number of coaches on a train, and the number of trains in use on a Company's system, would amount to a not inconsiderable sum per annum. As to the relative dangers of gas and electricity, the trouble of electricity firing trains (with in some cases very serious results) seems to be a constantly recurring one. We were reading last Wednesday that, the previous evening, a somewhat alarming accident occurred at East Ham Station, on the District Railway, through (according to the explanation) "an armature plate falling on to the metals, and causing too much current under first a Wimbledon train and then an Ealing one." This had the effect of igniting the under parts of the first carriages of the trains as they were proceeding on their journey. Fortunately, however, the Wimbledon train had not proceeded far before the driver noticed the accident, and returned to the station, where both trains had at once to be put out of service.

The members of the Western District Section of the Scottish Junior Gas Association will bring the present session to a close next Saturday with a visit to the Philpstoun Oil-Works.

The Junior Institution of Engineers will visit on Saturday afternoon next the Fortis Green reservoir works of the Metropolitan Water Board, whose Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) is the President of the Institution.

LOCATION OF LIGHTS IN RELATION TO ILLUMINATING EFFICIENCY.

The members of the Illuminating Engineering Society (U.S.A.) have been considering the effect of the position of lights upon the efficiency of the illumination; and papers on the subject were recently given before the several sections. The matter and data furnished in the contributions are of an interesting character, and, though dealing with electric glow-lamps, provide useful enough information for those who are generally concerned in lighting matters. The papers, to all intents and purposes, again raise the important problem of indirect lighting—one which merits full consideration on the part of lighting experts, and, if the cost conditions were but equal, would undoubtedly find numerous advocates. The authors make their own deductions from the various data that they have obtained; but it is perhaps an open question whether the figures submitted will have the same significance to others.

The more important paper was read by Mr. P. S. Millar, whose series of tests made in the illumination of a small room, lead him to attribute a high value to lighting by indirect methods. The author states his purpose to be the consideration of the relative efficiencies of four different methods of indoor illumination which are in common use. Incandescent electric lamps, with various fixtures and in varying positions, were employed in the tests. The test-room, possessing three windows, measured 16 feet by 11 feet, and was 12 ft. 6 in. high. The ceiling (of steel girder and brick arch construction) and walls were finished in a light buff colour, the reflection coefficient of which was neither extremely low nor high. The tests were made with a Weber photometer on a horizontal plane 3 feet above the level of the floor, and in twelve different positions in the room.

The four lighting installations under examination were—

Ceiling Installation.—Twelve 16-candle lamps in the ceiling, tip downward, one lamp directly over each of the twelve testing positions.

Drop-Cord Installation.—Six 16-candle lamps on drop cords, suspended at a height of 9 feet above the floor level, and fairly equally distributed over the testing positions.

Chandelier Installation.—Four 16-candle lamps at a height of 7 ft. 1 in., and carried by a chandelier suspended in the centre of the room. The chandelier arms were approximately 18 inches long, and the lamp axes placed at an angle of 45 degrees with the vertical.

Wall-Bracket Installation.—Four 32-candle upright lamps on brackets 7 feet above the floor, one on each wall.

From these four systems and sets of conditions the author submits figures and data to show the effect of location upon the general illumination. All the efficiency values are based upon the numerical averages of the figures representing intensity of illumination at the various test stations, these being located at centres of equal areas symmetrically disposed in the room. Bare lamps only are taken into account, since with radically different installations no comparison could be made with reflectors. Incidentally, however, the author remarks that by the use of reflectors in the drop-cord installation a gain of 46 per cent. in intensity of illumination was made; and he gives side by side with other data the figures of his tests of lamps fitted with reflectors.

Mr. Millar furnishes a table showing the efficiency secured from each installation—the lamps being bare.

Table I.

Installation.	Position of Lamp.	Height above Plane Investigated.	Efficiency of Illumination in Terms of Ceiling Lamps.
			Per Cent.
(A) Ceiling . .	Pendant.	9 ft. 2 in.	100
(B) Wall-bracket .	Upright.	4 0	115
(C) Drop cord. .	Pendant.	6 0	136
(D) Chandelier .	Axes 45 to vertical.	4 1	194

Proceeding to deal with the part which walls and ceilings play in the illumination of the horizontal plane, the author reminds his readers that a small room is under consideration, and that therefore reflected light from the walls is of much importance as affecting the average intensity of illumination throughout the entire plane in which the measurements are made.

A table (II.) is submitted in which the light received directly from the lamps is contrasted with the total illumination due to this cause and wall and ceiling reflection together. The direct illumination is obtained by computation; the candle power, the distances from the lamps to each test station, and the angle at which the light rays strike the horizontal plane, all being taken into consideration. The sum of these values at a particular test station is taken as the intensity of illumination produced by the lamps directly. The table is, of course, a summary, and presents the averages of the various tests more fully detailed by the author in his paper. It is not to be forgotten by our readers that the figures are relative rather than comparative, since the initial lighting powers of the several installations are not the same. The twelve ceiling lamps have a nominally aggregate candle power of 192, the drop-cord lamps of 96, the chandelier of 64, and the wall-brackets of 128. The author does not concern himself with costs resulting from these differences, dealing simply with reflective values. The £ *s. d.* side of the question, however, cannot be ignored, since it is just the factor which makes lighting a problem at all.

Table II.

Installation.	Direct Illumination from Lamps (Computed).	Total Illumination Measured.	Increase due to Diffused Reflection.	K.
			Per Cent.	
(A) .	8·5 lux (= 0·72 ft. c.)	22·5 lux (= 1·90 ft. c.)	166	0·62
(B) .	7·0 ,, (= 0·59 ,,)	14·8 ,, (= 1·25 ,,)	113	0·53
(C) .	8·9 ,, (= 0·75 ,,)	14·0 ,, (= 1·18 ,,)	69	0·36
(D) .	11·6 ,, (= 0·895 ,,)	16·7 ,, (= 1·40 ,,)	45	0·31

Note.—K is the factor for wall reflections which appear in the formula $E = e\left(\frac{1}{1 - K}\right)$

[The "foot-candle" values given in parentheses have been calculated for the purposes of this article.]

The author, following the above table, draws attention to the figures, and states that, with all other conditions constant, different locations of the lamps vary the reinforcing effect of the ceiling and walls throughout a range of from 45 to 166 per cent. He adds that the extent of the variation of the factor K, as shown in the table, will be appreciated when it is seen that with the factor 0·31, which obtains with the wall-bracket installation, the effect of the reflected light from the ceiling and walls is to increase the illumination by 45 per cent., while with the factor of 0·62 which obtains with the ceiling installation, the effect of the ceiling and walls is to increase the illumination 166 per cent.

Mr. Millar then proceeds to base conclusions as to the reflecting efficiency of walls and ceiling upon the data obtained from the ceiling, drop-cord, and wall-bracket installations. Dealing first of all with the total flux of direct light, his calculations give him the information that only 5 to 10 per cent. of the total light emanating from the bare lamps goes towards the direct illumination of the plane. In the case of the drop-cord installation, when the lamps have no reflectors, only 8 per cent. of the light is effective in this manner; 92 per cent. going towards the ceiling and walls above the lamp level. After more or less multiple diffuse reflection, the portion of the latter which is not absorbed finally assists in the illumination of the plane tested. This 92 per cent., if directed at the plane, would have increased its illumination by about 1150 per cent. The portion of it which finally reaches the plane increases the illumination by about 113 per cent. Thus 90 per cent. of the light which falls upon the ceiling and walls, or 83 per cent. of the total light generated, is absorbed. The author makes somewhat similar calculations for the ceiling and wall-bracket installations.

From the whole of his work, the author concludes that, in the room described, with different locations of bare lamps, (1) the relative illumination, in terms of that produced by the ceiling installations, varies from 115 to 194 per cent.; (2) the increased illumination on the plane investigated, due to diffuse reflection from ceiling and walls, varies from 45 to 166 per cent.; (3) the factor K varies from 0·31 to 0·62; (4) the net reflecting efficiency of the ceiling and walls varies from 4 to 10 per cent.; (5) from 55 to 74 per cent. of the total light generated is ineffective.

The work done by Mr. Millar is undoubtedly very useful. His tests and generally the data he supplies, however, must have other lessons for lighting engineers. One would perhaps have been more keenly interested had the author made his tests more strictly comparative. The use, for instance, of the drop-cord installation (the initial candle power remaining the same) at different altitudes from the ceiling downward, would have provided rather more valuable data. It is true that the flux of direct light changes with the varying angle of the light-rays; but this defect obtains in any case. Taking the data as they are given, it is useful to note that the six 16-candle power drop-cord lamps give an average of 14·8 lux compared with only 22·5 lux for the twelve 16-candle ceiling lamps. When the six drop-cord lamps are provided with the usual reflector shades, an average of 21·7 lux is recorded in the author's paper, or practically the same illumination from half the lamps. Here most distinctly comes in the element of cost, and decidedly against ceiling illumination, where economy is to be taken into account. A fact such as this—proving first that direct light is of considerable consequence, and next that ordinary reflectors are more serviceable and certain than ceilings—gives another and unimplied significance to the author's suggestion that illuminating engineers require to be very careful in their use of the factor K.

The chandelier tests are of little service in the author's general comparison of the uniform illumination of the whole area of the room, since the central pendant is intended for special purposes, such as localized lighting. The advantage of the method, however, to the latter end is shown by Mr. Millar's detailed tables. The chandelier with an aggregate of 64 initial candle power gives a maximum illumination near the centre of the room of 28·2 lux; while the maximum light from the ceiling lamps of 192-candle power is only 25·6 lux.

Remembering that the lamps with which the author conducted his experiments were all electric glows, giving their light-rays of highest power in a horizontal direction, it would be exceedingly interesting to have a similar series of tests with inverted incandescent gas-burners, which shed their maximum light-rays at a downward angle. The results in general foot-candle illumination

would give rise to conclusions altogether different from those of Mr. Millar, and the comparison of costs would afford considerable gratification to illuminating engineers—of the gas persuasion.

WHAT IS "COALITE"?

In an editorial article on the much-talked-of smokeless fuel "Coalite," allusion is made to a letter on the subject that Sir W. H. Bailey has published in the "Manchester Courier." We make the following extracts from the letter.

"An Ingenious and Absurdly Simple Process."

For the past few months, I have been investigating a new method of taking the smoke from coal. This has been done by a clever inventor, who has, by an ingenious and absurdly simple process eliminated from ordinary coal the ingredients that make smoke, and which also decrease coal's calorific value. This has been done in such a manner that not only is the "Coalite"—as the inventor calls it—perfectly smokeless, but the cost of the process enables the "Coalite" to be sold at a price much lower than that of common gas coke; and I am told, and I believe, it is one-third hotter than the coal untreated, by reason of the very small amount of oxygen required to support combustion, for all who know anything about coal agree that, under the present clumsy methods of burning it, a great volume of oxygen is required, which means a high velocity of heat up the chimney, whether under steam-boilers or in domestic grates.

I have seen a bright fire of "Coalite" in what we would call a large dining-room grate that only requires for the flue a piece of tube with a 3-inch bore, for this fuel is like the poor, it remains with us. It is not in such a hurry to get up the chimney and escape, for it has a gentle velocity. I cannot say more about this invention at present, as I am making investigations with an apparatus that I designed for the late Dr. Angus Smith for experiments on the temperature and velocity of waste gases in chemical works' chimneys about thirty years ago; and I am inquiring into the commercial value of this invention. At present I am of opinion that it is one of the most amazing inventions of this generation; for if we can treat ordinary coal without producing any smoke at all, and obtain an increase in temperature without an increase in price, it is a wonderful departure, and of great value to the nation. Arrangements are being made to show it in public in fire-grates in the vicinity of the Manchester Town Hall, where all will be invited to look at it.

I may say that for some months past, the Coal Smoke Abatement Society of London have had "Coalite" under observation by their scientific experts in open domestic grates and stoves, and have issued a report in which it is stated "that if there is any soot left in the chimney from coal it destroys it." The report states that it produces a bright and lively fire with more flame; and in conclusion adds "that it is absolutely smokeless, and an efficient remedy for the smoke nuisance."

Works at Trafford Park—A Chemist on Smokeless Coal.

Dr. Grossmann, in the "Manchester Guardian," has just commenced a series of articles discussing this question of smokeless fuel from coal. Interest it appears has been aroused in Manchester not only by the letter of Sir William Bailey, but by a report that the "Coalite" people have acquired a large tract of land at Trafford Park for the purpose of erecting works for the manufacture of smokeless coal. In examining the question of producing such a fuel, it is pointed out by Dr. Grossmann that it should be, in order to be generally acceptable, no dearer than ordinary coal. It is said that "Coalite" will not only be as cheap as coal, but probably cheaper. Nothing is publicly known about the details of its manufacture, except that it is said to be produced from coal by extracting the smoke-producing constituents from it. In the absence of this information, Dr. Grossmann considers whether, from the technical chemist's point of view, there is any reason why it should not be possible to produce smokeless coal from ordinary coal; and he concludes just as we expected to find with this statement: "If we were to heat coal in a closed retort at such a low heat as only to produce the hydrocarbons which in an ordinary fire would give rise to smoke, we could regulate the operation in such a manner as to obtain a residue which might be similar to anthracite and for all practical purposes be a smokeless coal. Whether that residue would be equal to coal in producing the blaze which adds so much to the comfort of an open fire is doubtful; *that it could not, weight for weight, be equal to the original coal in heating power, is certain.* Many modifications of such a process could be easily designed. Given the problem of producing a smokeless fuel from ordinary coal, there are no insurmountable difficulties in the way of solving it. Whether such a process will be remunerative, depends upon a number of circumstances."

At a recent meeting of the Coventry City Council, the following re-arrangement of the Water Department was sanctioned: (1) The appointment of Mr. J. E. Swindlehurst, the City Engineer, as Water Engineer, at an increased salary in respect of the additional duties; the retention of the services of Mr. E. J. Durnell as Consulting Water Engineer; (3) the appointment of the Engineer in charge of the sewage pumping-station (Mr. S. Toon) to supervise the Spon End and Whitley pumping-stations, under the direction of the City Engineer; and (4) the appointment of a Chief Water Inspector to take charge of the staff of the distributing department.

COST OF DIFFERENT METHODS OF LIGHTING.

The current number of the "Journal de l'Eclairage au Gaz et à l'Electricité" contains an article by M. Grebel on the above subject, in the course of which he gives a table showing the net cost of the different systems of lighting now in general use. In compiling it, he based his calculations on prices current in towns of average size in the neighbourhood of Paris—gas being taken at 20 c. per cubic metre, or 4s. 6d. per 1000 cubic feet; and he reckoned that the burners or lamps would be in use for four hours a day for 200 days per annum. We have extracted the following figures from the table:—

Lighting Agent.	Lamp or Burner.	Illuminating Power.	Consumption per Carcel-Hour.	Net Cost per Carcel-Hour.
	Free Flame.	Candles.	Grammes	Centimes
Candle (stearine).	Taper-stand	1·3	90	15·360
Oil	Lamp with round burner	10·0	42	4·740
Petroleum	,, ,, ,,	15·0	40	1·880
	Disc burner	40·0	35	1·360
Acetylene	Flat-flame burner (large)	35·0	8*	1·355
Gas	Butterfly burner	10·0	73†	3·405
	Circular burner	20·0	52‡	2·365
	Incandescent.			
Petroleum	High-pressure burner	500·0	5	0·430
Alcohol	Domestic lamp	50·0	20	1·795
Benzol	,, ,,	50·0	8	0·965
Lecomte gas	Special burner	50·0	5	0·525
Gas	No. 1 burner	50·0	8§	0·500
	High-pressure burner	500·0	5‖	0·270
	Glow.		Watts.	
	Carbon filament lamp	16·0	35	2·915
	Metallic ,, ,,	50·0	20	1·648
	Arc.¶			
Electricity	Ordinary carbon lamp, with opaline globe	350·0	11	1·013
	Mineral carbon lamp, do.	500·0	7	0·770
	Mercury vapour lamp	300·0	5·5	0·605

* Or 7 litres (0·25 cubic foot).
† Or 140 litres (4·94 cubic feet).
‡ Or 100 litres (3·53 cubic feet).
§ Or 15 litres (0·53 cubic foot).
‖ Or 10 litres (0·353 cubic foot).
¶ Two in series on 110 volts.

The author explains that, according to the laboratory experiments, the consumption of a stearine candle per carcel-hour was 75 grammes; but he adopted the figure of 90 grammes, inclusive of waste. For ordinary incandescent burners, 12 litres (0·42 cubic foot) per carcel-hour is sometimes given as the consumption of gas; but, taking into account the loss of illuminating power of the mantle after having been in use a certain number of hours, he took 15 litres as the figure. The inventors and sellers of incandescent petroleum lamps assert that they can produce a carcel-hour with 4 grammes of oil; but M. Grebel says it cannot be obtained with less than 5 grammes. Electric incandescent lamps consume from 2½ to 3 watts of current per candle when they are new; but, as they soon tarnish, their average consumption is rarely less than 3½ watts. The author's conclusion is that though the cost of lighting by petroleum, with small lamps, is nearly three times as great, on an average, as with the No. 1 incandescent burner, and that for the same hourly consumption three times as much light can be obtained with gas as with petroleum, the latter will for a long time remain the lighting medium in small households in France, where an installation of gas entails on the consumer initial as well as current expense.

CALORIFIC VALUE AND ILLUMINATING POWER.

By H. Leicester Greville, F.I.C., F.C.S., &c.

In the "Journal" for the 5th inst., there appeared some interesting notes under the heading of "Under the New Testing in London." It was, in brief, stated that by the courtesy of Dr. Clowes, the Chief Chemist to the London County Council, the "Journal" had been furnished with a weekly tabulation of tests made at the official testing-stations covering the winter period of exigent conditions in gas manufacture." At the end of the editorial comments on the general subject, there was the remark: "We may take an early opportunity of making a further inspection of these instructive returns." Of course, I do not know whether the publication of the actual figures is permissible, or whether the statistics given by Dr. Clowes were intended solely for comment. The general tenor of the remarks I have referred to was that, while the statutory illuminating power under the new *régime* had been fully up to, and even exceeding, the statutory requirements, there appeared discrepancies between the illuminating power and the calorific value of the gas supplied by the three principal Gas Companies—viz., the Gaslight and Coke, the South Metropolitan, and the Commercial. It is upon this point that I wish to make some comment.

Broadly speaking, with various mixtures of pure coal gas and carburetted water gas in varying proportions, there must always

be discrepancies between preconceived ideas and actual comparisons, with the ever-varying conditions of manufacture. Further, there is a constant (and laudable) endeavour on the part of the Gas Companies to make gas as cheaply as possible, to the mutual advantage of producer and consumer. Constant experiments are being made, and can be expected in the future, with regard to this object. Every altered condition will give different ratios between the calorific value and the illuminating power. The adoption of a different system of testing for illuminating power affects the previously accepted ratio between light and heat efficiencies. I have made many experiments as to the ratio of light and heat, when the system of testing illuminating power was the table photometer with the gas consumed in a Sugg "London" argand burner up to a 16-candle flame with a 6-inch by practically a 2-inch chimney. My results are quoted by Mr. W. J. Dibdin in his book on "Public Lighting by Gas and Electricity." Pure coal gas gave a reasonable ratio between increase of light and heat. For instance, in summing up, Mr. Dibdin gives the following figures:—

Coal gas of 11-candle power	500 B.Th.U.
" " 17 " "	682 "
Difference for 6 candles	182 B.Th.U.

This is equal to 30 B.Th.U. per candle. Taking 11 to 14 candles (a difference of 3 candles), we have the respective figures of 500 and 592 B.Th.U.—an increase of 92 B.Th.U. for 3 candles, or 184 B.Th.U. for 6 candles (*pro ratâ*).

Carburetted water gas (illuminating power not stated) is given as 470 B.Th.U.; and plain water gas has (according to Butterfield) a calorific value of 286 B.Th.U. There are therefore two facts: (1) That even carburetted water gas (of a presumably fairly high standard) has not the same calorific efficiency as even 11-candle pure coal gas; and (2) that the altered conditions of testing for illuminating power have largely affected the old statistics, so as, without suitable correction, to make them unreliable.

So far as I know, there are no published statistics as to the alleged illuminating power of a gas as ascertained by the older method and the new by the new burner. I have been informed that the Carpenter burner gives an increased credit of some 2 candles to what was considered 14-candle gas. In a letter in the "Journal" for the 22nd of January last, Mr. Charles E. Baker states: "I doubt very much whether gas consumers outside London, or the local authorities who represent them, are fully aware of what this change of burner means." He goes on to infer an increase of 2 to 3 candles in the indicated value of the gas simply by the adoption of the new burner. This may very possibly be an exaggerated statement; but, as far as I know from consultation with my professional brethren, the No. 2 Carpenter burner gives an advantage of 2 candles on a gas which was, on the older method, recorded as 14 candles. In other words, gas required to be of 14-candle value could be made of 12-candle value (on the old system) and pass as 14 candles under the new. There may possibly not be the least objection to a system of ascertaining illuminating power which is fairer to the gas company than any previously in use, and, even at the best, nothing to be compared to what the public can secure from their gas by the use of cheap incandescent burners. The main point is the question of calorific value, and that we have to alter our predilections to suit modern methods. Thus, 14-candle gas (old method, say, 592 B.Th.U.) would be 12-candle gas (new method, say, 530 B.Th.U.), or a difference of roughly 10 per cent. We have to wait for a revised table as to ratios between illuminating power and calorific power. Under the new system of gas-testing, the London County Council have, no doubt, many valuable statistics; but at present these are not available either for reference or comment.

There are no more comments necessarily to be made on this branch of the subject. The other aspect may be briefly stated thus: Are the modern methods of ascertaining the heating value of gas reliable? An answer to this question can be, I consider, without dispute, made in the affirmative. The Junkers and the Simmance-Abady calorimeters have, by repeated experiments by different operators (including myself), given practically coincident results. The latest form is that invented by one of the Gas Referees—Professor Boys. This eminent scientist seems to have considered that an improvement could be made over existing forms of instrument. In the first place, by using a pair of No. 3 union-jet Bray burners in place of a single bunsen, it is claimed that the height of the calorimeter can be materially reduced. In this there is no doubt that Professor Boys is correct. From the inefficient illuminating power produced by ordinary Bray burners, no expert would form any other than one opinion—viz., that the air supply was more than sufficient for the production of the best illuminating effect. In other words, the burners were practically heat producers.

Passing to other details, a different form of imparting the heat of combustion to the water has been introduced, which may have its advantages. There are, however, two striking points from which the Boys calorimeter differs from (say) the Junkers. I have unfortunately not had an opportunity of either seeing or having any practical experience of the use of the "Boys;" but the claim of having the three thermometers on a level with the eye for reading must be a distinct advantage, and not having to seek an elevated position for taking a reading is another.

Professor Boys speaks, with reference to the Junkers, of "having to jump up and down steps to make alternate readings." This, from my experience, is quite true; but my main objection has always been the difficulty of reading the graduations of Continental thermometers. Without very keen eyesight, a magnifying glass, or a strong light behind, the matter is very difficult, and an error in reading makes a serious difference. The difficulty in regard to the height of the thermometers could, however, be easily met by lowering the table on which the apparatus stands so as to bring it within the level of observation. Even if the thermometers were at different levels, it is easier to stoop than to climb. The Simmance-Abady calorimeter has very legible readings on its thermometers, with enamelled back scales; and there is not the same difficulty as there is in the Junkers calorimeter in obtaining legible readings.

Another point about the "Boys" calorimeter may be mentioned. Professor Boys seems to have had on his mind that some special provision should have to be made for the effect of possible corrosion from the deposit on the instrument of the sulphur products in the gas; and he quotes cases in which he had seen that ordinary calorimeters had suffered from corrosion. Of course, this question is a serious one—more serious with the increased proportion of sulphur compounds present in the modern gas supply. The test for ordinary calorimeters (as to whether this is so or not is a serious matter for consideration) should be to examine the condensed outlet product for the presence of any metal. If there is none, there can be no corrosion. In any case, a limited quantity for a limited period would not occasion serious error. In my experience, I have never found the incident occur; but there is no doubt that Professor Boys' recommendations as to the use of his own instrument are wise with regard to accuracy and to the permanent reliability of the testing apparatus.

HIGH-PRESSURE GAS LIGHTING IN SCHOOLS.

A paper on the use of high-pressure gas for the lighting of schoolrooms was read by Dr. P. Schumann, of Munich, before the last meeting of the Bavarian Association of Gas and Water Engineers; and it has recently been printed in the "Journal für Gasbeleuchtung."

The author's communication describes the preliminary experiments which were made upon the lighting of a schoolroom in a large educational institution, by the authorities of the Municipal Gas-Works at Munich, which experiments were so successful that a permanent installation of the same kind was erected to serve the greater part of the building; and it has been in operation ever since October, 1905. The school where the experiments were carried out contains a considerable number of rooms of different sizes. The theatre has been fitted with electric arc light, as the latter is said to be somewhat more convenient than gas for optical lantern work. Elsewhere in the building gas is employed; 140 ordinary incandescent burners being used in some of the rooms, more particularly for the illumination of the students' tables, while the rest of the building has been provided with 134 high-pressure "Millennium" burners. The plant for the compression of the gas is erected in the cellar. The gas passes through two 200-light meters, arranged in parallel, into two compressors driven by electric motors of ¾ H.P. and 1¼ H.P. respectively. The whole plant is capable of supplying about 2200 cubic feet of gas per hour at a pressure of 52·4 inches of water.

When the initial experiments were commenced, it was taken for granted that an illumination equal to 3·4 candle-feet on the writing-tables, &c., would be sufficient; and it was decided to adopt an indirect system of lighting, though tests were to be made in order to see whether the advantage lay with purely indirect or with partially indirect light. The room selected for the tests had a floor surface of 830 square feet, and was approximately 12 ft. 6 in. high. In this room, six No. 200 "Millennium" lights were so slung that the upper surface of the reflectors was 4 feet from the ceiling. The lamps were so distributed that the distance between them was, as nearly as possible, twice that of each from the nearest wall. They consumed 8·66 cubic feet of gas per hour, measured before compression. The room was freshly whitewashed and emptied of furniture before the measurements of illumination were made; and the windows were coated with white paper. When the mantles had burnt for about ten hours, the illumination was measured at twelve spots 3 feet above the floor—some positions being immediately under the lamps, and others midway between them. Measurements were carried out under four different conditions: (I) When the light was purely indirect—*i.e.*, the reflectors of the lamps were sheet metal painted white on the inner side; (II) when the light was to some extent direct, (*a*) the reflectors being composed of 4/4 flashed glass, (*b*) of 6/4 flashed glass, and (*c*) of ordinary opal glass. Expressed in candle-feet, the figures obtained were as follows:—

	I.	II.(*a*)	II.(*b*)	II.(*c*)
Average	6·20	8·45	7·80	7 8
Maximum	6·76	9·90	8·96	8·8
Minimum	5·32	6·84	6·68	7·0

The results show that the suggested illumination of 3·4 candle-feet was exceeded in every position, so that a smaller number of lamps might have been used. They also show that, for a given amount of candle power developed, the illumination was less uniform when the light was entirely indirect than when it was

partially direct. The mean illumination was roughly 28·5 per cent. higher when 4/4 flashed glass was used, and 21·5 per cent. higher when 6/4 flashed glass was used, than when the reflectors were opaque. The general effect was in all cases excellent; being at its best with the thicker flashed glass and the opal glass. The thinner flashed glass allowed the mantles to be visible, and gave them a reddish colour. The darkness of the metallic reflectors produced a disagreeable effect.

In consequence of the success of these experiments, the main installation was then proceeded with; and it was decided to adopt 6/4 flashed glass for the reflectors of the lamps. According to the size of the rooms, they were provided with four or five lamps, and in each room two outlet ventilators, 18 in. by 20 in. in size, were fixed in the ceilings; and they were found to keep the atmosphere in a perfectly agreeable condition. When the burners had been in use for nearly three months, they were reported to give every satisfaction except in a few rooms, where a falling off in the illumination was apparent. The defect was clearly due to two causes—first, that the regulating collars of the inlets for primary air were apt to slip round, thus reducing the quantity of air admitted and diminishing the illuminating power of the burners; secondly, that some of the mantles employed had been of inferior quality. It was therefore decided to change the make of mantle, and to use larger burners (No. 300), which consumed 14·1 cubic feet of gas per hour, as measured before compression. In these new conditions, measurements of the illumination were made in fourteen or fifteen different positions in two rooms, the smaller of which was provided with four lamps, and had a floor surface of 660 square feet; while the larger was provided with five lamps, and had a floor surface of 830 square feet as before. In the smaller room, the illumination values in candle-feet measured upon the working-tables were: Average, 9·45; maximum, 11·15; minimum, 8. In the large room they were: Average, 9·7; maximum, 11·1; minimum, 7·8.

The new arrangement was entirely satisfactory; and even if one or other of the lights happened to be burning badly, the average illumination upon the benches did not fall below 6 or 7 candle-feet. It was, however, found that the lamps required a considerable amount of attention if the illumination was to be kept uniform. When in regular use, the reflectors and the burners needed cleaning every two or three weeks; and it was necessary that the mantles should be renewed with sufficient frequency. The average lifetime of the mantles on the high-pressure gas-burners was 150 hours. The last-mentioned figures indicate that in a room 12 ft. 6 in. high, when due allowance is made for the diminution in illuminating power of the mantles, a mean illumination equal to 6·8 candle-feet can be obtained from the combustion of 6·85 cubic feet of gas per 100 square feet of floor surface; whereas the experiments carried out by the Committee of the German Association of Gas and Water Engineers, upon purely indirect lighting in a room 13 feet high, gave the corresponding consumption of gas to be 8·17 cubic feet. The author therefore considers that a suitably arranged installation of high-pressure gas lighting is well adapted for school buildings. The best system of illumination, in his opinion, is one of semi-indirect light.

The Competition for the Best Tar for Road Making.

In view of the importance of the above matter to the gas industry, we have been asked to remind our readers that the latest date for the receipt of entries is the 31st inst. The chief object of the competition, to which we have already called attention (*ante*, p. 399), is to ascertain the cheapest method, consistent with efficiency and effectiveness, of treating crude tar—not necessarily the distilled or refined article—to make it suitable for use upon the road. The merits of the competing preparations will be judged largely by considerations of cost, ease of application, efficiency, dust-preventing capacity, insolubility, weatherproofness, power of adhesion to various road materials, time required for, and effectiveness of, setting, and freedom from harmful or offensive constituents or qualities. Full particulars and entry forms may be obtained on application to Mr. Rees Jeffreys, the Hon. Secretary of the Roads Improvement Association, 1, Albemarle Street, Piccadilly, W.

A legal aspect of underground water is brought into prominence by a Bill recently introduced in the United States Senate, authorizing the City of New York and the Hudson County Water Company to lay two pipe-lines across the Kill von Kull from Bayonne (N. J.) to the borough of Richmond. Some time ago, the Company made a contract to supply the borough with water from one of the sources controlled by the East Jersey Water Company. The contract was at the rate of $75 per million gallons for the first 3 millions, and a sum decreasing gradually to $65 per million for 10 million gallons or more daily. The New Jersey Courts prevented the execution of this contract in the manner intended, because there is a law forbidding the diversion of the water of any river, stream, or lake to any point outside the State. On the other hand, a supply from driven wells is in the same legal class as oil or natural gas, and may be sold outside the State. The Hudson Company have instituted negotiations with the Board of Public Works of Newark for leasing their driven well plant.

NEW ENGLAND GAS ASSOCIATION.

The Presidential Address.

At the recent Annual Meeting of the New England Association of Gas Engineers in Boston (Mass.), the President—Mr. W. M'Gregor, of Pawtucket, R.I.—delivered an interesting address. After congratulating the members of the Association (the oldest in America) on being about to celebrate their 37th anniversary, and doing so full of confidence and enthusiasm, and with the resolve that, though other systems of lighting might rise and fall, gas should endure and prevail (an attitude which he thought was justified by the present position of the industry), he made the following remarks.

The wave of prosperity that has in such an astonishing, if not unprecedented, manner swept across this country, has not passed us by. On the contrary, we have enjoyed our full share of success and good fortune. Advance sheets indicate a general increase in output and sales all along the line, which goes to demonstrate that the wheels of the industry are well oiled, and that managers are fully abreast of the times. Five years ago the quantity of gas sold was 9,286,700,000 cubic feet; and now it is 13,021,200,000 cubic feet. The decrease in the price of gas averages 8·4 per cent.; the increase in meters is 44 per cent., and of the gas sold 40 per cent. Though these figures are hard to grasp, a cursory consideration of them impresses one with the fact that the gas industry is constantly growing and expanding. Electricity is farther away than ever from proving to be the "death knell," as was prophesied and expected. It has proved to be to us a blessing in disguise. The lethargy so characteristic of former managements, when monopoly prevailed and competition in lighting was practically unknown, is a thing of the dead past. Competition has been a stimulus and inspiration; so that where stagnation and failure prevailed we find expansion and prosperity. All over the world it is being fully demonstrated that, where convenience, cost, and certainty are considered, the public receive the best all-round satisfaction from gas—not only for lighting, but also for heating and power. It is all very well for our electrical friends to descant on the apparent advantages of electricity—absence of odours and heat, lessened fire risks, and simplicity of application—but, after all is said and done, it is very much as Sir William Preece declared: "The gas people are quietly gathering in the money while the electricians are condemned to go on trying to sell the same old wares. A lamp [referring to Edison's carbon filament one] which is worse rather than better after 25 years, is poor stock-in-trade." In the light of such observations, it is easy to understand why gas companies find their product in greater demand than ever, and why hundreds of consumers, after trying electricity, have come back to using gas.

Our statistics show that everywhere the price of gas is constantly being lowered—sometimes voluntarily, sometimes by moral or legal compulsion, sometimes through the working of the scientific sliding-scale; and this, too, when the price of about everything entering into the manufacture, production, and distribution of gas—labour, coal, iron, &c.—is on a constant rising scale. This imposes increased responsibilities, obligations, and anxieties on the gas manager. Now he is compelled, as never before, to practise judicious economy all along the line, to pay vigilant attention to every detail of manufacture, construction, and administration, and to make full, proper, and wise use of improved or new processes, and to instal many of the modern labour-saving devices, such as charging and drawing machines, coke and coal conveyors, &c.

But this lowering rate for gas, with advancing price for commodities entering into its manufacture, is not the only source of care and anxiety. The socialistic tendency of the age must be taken into consideration and be allowed for. It manifests itself in various and obvious ways. We find it largely responsible for the municipal ownership propaganda; we see it cropping out in "unnecessary and unfair legislation," in "inequitable taxation" suggestions, in its "encouragement of unwarranted competition in the face of existing reasonable service," and in the restlessness and irresponsibility of many of our employees. Of course, we take it as "all in the day's work"—go on serving the public early and late to the best of our ability, and doing our utmost to postpone the day when Socialism will become rampant.

But you, experienced and skilful gas men, do not need to be told that, of all projects fundamentally unadapted to the peculiar customs and institutions of America, municipal ownership is the best exponent. When you can have changed the State and municipal atmospheres of the land; when you can have eliminated all taint of politics or political expediency from those in public office; when you can have the average citizen as scrupulous in spending or in advocating the spending of the money in the public treasury as he is of the money in his own purse; when partisanship in local affairs is dead, and worth and capacity count for more than influence or pull—then, and then only, will municipal ownership have a chance to succeed. If thoroughly capable and efficient men, who have made the gas industry their life-work, are growing prematurely old through their efforts to profitably and successfully manage their business—and this, too, despite their adopting all up-to-date commercial methods, and taking advantage of improved efficiencies and economies in operating—how easy is it to foresee the outcome of politicians taking charge, of the "wide-open" policy of expense installed, and of experts giving place to

theorists, amateurs, or camp followers. But "man never is, but always to be, blest." What we may say will be regarded as *ex parte*. But when the advocates of municipal ownership get through their study of the fictitious records of success of municipal ownership in Great Britain—conservative, peculiar, abnormal old England—and have their way in experimenting on a large scale with it in the United States, I shall be more than surprised if they do not find a fierce and implacable Nemesis lurking in every one of their undertakings; and the public as a whole must pay for it.

That we ourselves are measurably responsible for the ills that afflict us and those that threaten us, few can deny. The days of high rates, large dividends, and indifferent service have left their sting. The public have had the facts ground into them; and now we suffer vicariously. Others of bygone days "sowed the wind," and we are due to "reap the whirlwind." Under the circumstances, there is but one sensible thing to do—re-educate the public. This can be done in part through publicity—one of the strongest safeguards of any public service corporation. A general system of uniform accounting should be in universal use. Even then, it being a human institution, it cannot, in the very nature of things, be altogether accurate or satisfactory. As men, definitions, and circumstances differ, so will reports. The personal equation which enters so largely into it is a variable quantity; and this almost precludes any general agreement and uniformity. But even so, if it is simple, yet comprehensive, the public can use it in comparing results obtained in various cities, and be able to clearly arrive at conclusions as to how what they get compares with what is furnished to others. Financial reports should be published regularly in the local papers, showing the results attained—the accurate cost of service, the way it differs from the nominal cost of gas in the holder, and other illuminating and material statistics. The people should be encouraged to study such reports. Let them see that they are getting a "square deal." They may not appreciate it, but they will be aware of it; and that is something.

For several years past the daily question with most of us has been: "What shall we do with our tar?" Very recently we had the pleasure of entertaining in Boston Sir William H. Perkin, the eminent discoverer of coal-tar colours, and the pioneer of the drug industry that has arisen therefrom. Much as America and Great Britain delighted to do him honour on the fiftieth anniversary of his discovery, much as his fame is secured for all time, yet, after all, what has it profited America or Great Britain? Our tar industry has not been affected for the better; the price we obtain is as low as even those who buy it could hope for. The same condition exists in Great Britain; but Germany has secured all the benefits, and last year her business in tar netted over $100,000,000 (£20,000,000). But all doors are not closed to us. The developments of the past year have shown us one wide open; all we have to do is to enter. I refer, of course, to the use of tar on our highways for the suppression of the dust and mud. This is no theory. In every-day use both in France and Great Britain, it has done well; in some parts of America it has also been successfully tried. It prolongs considerably the life of the roads—binding the surface, resisting the disintegrating tendency so much now in evidence as a result of the vacuum pressure and disturbance caused by the rapidly propelled automobiles. It is waterproof, improves the appearance of the roads, costs less than the oils and other preparations usually tried, and even than the ordinary sprinkling of water. One or two applications a year to the road are all that are required. In looking over the official reports of the results achieved, I find practical unanimity as to its success. But there is much diversity in the way in which the tar is prepared and applied. Some take the tar just as it comes from the well, put it in an ordinary watering-cart having a special sprinkler, and report it effective for the suppression of the dust nuisance, and causing no annoyance from the characteristic odours. Others extract the water from it, boil it, and apply it with brushes—rubbing it well into the surface of the road. These are the strongest advocates, and the most numerous, of the use of tar. Others, again, boil it, heat broken granite, limestone, or slag (preferably the last), mix them, and then use it as a sort of macadam. These are also enthusiastic as to the results. It must be confessed, then, that it rests with us to convince those in charge of our highways and those higher up that it will pay them to look into this matter, to test it, and to adopt it. If the application of tar will eliminate the dust nuisance, it will mean much to those who use the highways, to those who live along them, and to us who have the tar for sale. It will also solve a vexatious, baffling, and expensive problem for the highway department, and at the same time be the means of our obtaining a satisfactory price for one of our chief bye-products.

It looks as if our tar troubles were ended; yet I long to see the day when there will be more co-operating among the companies. What a simple matter it is—theoretically, at least—to arrange for a common plant for the use of companies occupying contiguous territory, for the proper treatment of their residuals. As the price of gas goes down, the need relatively increases for higher prices for the bye-products. Many of the smaller companies might not be justified in going to the expense of installing the necessary stills, kilns, or other apparatus; but if a convenient extracting plant were built—preferably at tidewater—by several of the companies acting as a unit, and full use were made of modern devices in obtaining the things of infinite value and importance from the bye-products, what a good thing it would be all round. What a help it would be towards keeping down the cost sheets. It has been said that "gas managers should be willing and anxious to go to any trouble in order to work up their residuals into as many saleable commodities as their circumstances and surroundings will admit." Something has to be done with them. They are valuable; and the need is great, too, for turning them into as much cash as is possible. What matters it if our gas-works do assume the appearance of a chemical engineering works? The thing is, does it pay? Can we not make better use of the ammoniacal liquor? Sulphate of ammonia is a valuable fertilizer; and it can be readily extracted in large and profitable amounts. A tar-distilling plant is a necessity for the simple, yet effective, treatment of the gas-works tar. This will add to the ease of selling it, and somewhat advance its price. From this also should be obtained the oil used by manufacturers of carbolic acid, and also creosote oil and its salts. The spent oxide of our purifying-boxes should be made to render up its valuable sulphuric acid, or by a Claus kiln its sulphur. The cyanides, now so necessary for treating low-grade gold ore, are also bye-products that should be recovered. It is a most impressive assertion of fact that many of the gas manufacturers of Great Britain are making use of some or all of these means to reduce their net manufacturing costs; and so well are they doing it, that for the last ten years their coal and oil bills have more than been met by the net cash received from their residuals. There is no good or adequate reason why we in America should not follow suit in this matter.

Other problems we must solve are: Is it possible to get the public so educated that it will accept a low-grade unenriched gas, if we supply free the incandescent mantles? With uniformity of pressure and quality, there can be little doubt that this would prove a wise thing all round. Another problem that will have to be attended to one of these days is as to how we can arrange for Sunday stoppage of carbonization. I believe that this will be insisted upon sooner or later; and the sooner we get to work upon it the better. Belgium has passed a "Sunday Rest Day Bill;" France has followed suit; and a Bill is now before the British Parliament compelling the provision of one rest day—preferably Sunday—in seven in all forms of service save domestic. We shall have to keep step with the times. The vertical retort question is still an open one, and one of absorbing interest. Reports from Dessau, Mariendorf, and Cologne continue to wax exultant over results attained; and detailed accounts tend to show that they have come to stay.

And now, in closing, let me say a few words on behalf of the Association and its meetings. If ever there was a time when gas men should work together, it is now. The three Associations that have federated into the Gas Institute have realized this most acutely. They believe that in union there will be strength, progress, and power. The tendency of the times is consolidation and concentration of effort. We here, in New England, stand for and by our own Association. It is the parent of them all, and possesses all the potentialities for very great usefulness. But we must make the best of our opportunities. We must have every Company in New England represented in our membership; and we must develop enthusiasm, so as to increase in numbers and influence. The questions that come before us are the live and vital ones of the profession. Each responsible individual who gets his daily bread by the gas industry has an immediate and personal interest in the furthering of its objects.

In order to have these meetings rich in results, it is absolutely necessary that the papers read and the discussions following should be productive of immediate and practical benefit. The members can make of them what they want. If those in charge of the smaller plants would only make the most of their opportunities, and regard their works as "research laboratories"—if they record their daily experiences, the expedients they are forced to, the complications that have arisen and the way they were solved, the tests made, the experiments tried, the failures, the successes, the improvements, the methods devised, &c., and come here and give us the benefit of their experiences, and secure commendation or the inevitable criticism and advice—what a transformation might occur. The larger plants do not admit of this; the smaller ones alone make it possible. And instead of those in charge of them modestly waiting for light from others, they should let their own light shine, and so help on the cause so near our hearts, and make these meetings successful.

A Prize for Industrial Hygiene.—The Council of the Society of Arts are prepared to award, under the terms of the Benjamin Shaw Trust, a gold medal or a prize of £20. The medal, under the conditions laid down by the testator, is to be given "for any discovery, invention, or newly-devised method for obviating or materially diminishing any risk to life, limb, or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and practically available means." Intending competitors should send in descriptions of their inventions not later than the 31st of December next to the Secretary of the Society of Arts, Adelphi, London, W.C. The descriptions may be sent in under the inventor's name, or under a motto, accompanied by a sealed envelope, enclosing the name, as preferred. The Judges will be appointed by the Council, who reserve the right of withholding the prize or of awarding a smaller prize or prizes, if, in their opinion, nothing deserving the full award is sent in.

DEFECTIVE DESIGN:

AS ILLUSTRATED BY THE BURSTING OF A CAST-IRON TANK.

By F. Southwell Cripps, Assoc.M.Inst.C.E.

Some time ago the writer was consulted as to the cause of the failure of a large cast-iron water-tank, of a type which is frequently met with on gas-works, water-works, railways, and the like. The bursting of the tank resulted in loss of life and much injury to property. The tank having been erected on a tower 80 feet high, it may be imagined that the sudden release of a great body of water at such an elevation would sweep all before it. This, unfortunately, was the case. The cause of the accident was undoubtedly faulty design; and as the design is a very common one, it may not be without interest to make known its defects, so that those who only work by "rule of thumb," or simply copy what others have done, may take warning. With this object, the writer's report (prepared shortly after the accident) is reproduced below. The report, after describing the tank and the nature of the burst, deals fully with the stresses, and upon this inquiry the writer founds the conclusions and recommendations with which the report closes.

Report on the Failure of a Cast-Iron Water-Tank Erected on a Brick Tower.

The tank is about 80 feet above the ground. It is 32 feet square and 16 feet deep, and overhangs the tower 1 foot all round. The bottom curb is curved (see figs. 1, 2, 3, and 4). The curb is 1 foot deep and $\frac{7}{8}$ inch thick. The two lower tiers of side plates are 4 feet square and $\frac{7}{8}$ inch thick. The two upper tiers are $\frac{3}{4}$ inch thick. The flanges throughout are $\frac{7}{8}$ inch thick, and project 2 inches from the body of the plate. The joints are caulked from the inside; the caulking fillet being planed.

The sides of the tank are stayed—

(1) By diagonal stays at about 4 feet pitch all over the sides, fixed at an angle of 45°.

(2) By two horizontal ties running from side to side each way—*i.e.*, four in all.

(3) By corner gusset ties fixed horizontally.

At the time I was called in to report upon the tank, after its failure, I found—

(1) That one corner had been carried away entirely, as shown in figs. 1 and 2. This, it will be seen, included a portion of the bottom curb, the rounded corner, and adjoining side plates.

(2) The other three corner plates of the curb were likewise cracked in the bend of the flanges (see fig. 3).

I am informed that at the time the tank burst, there was about 8 or 9 feet of water in it; but it had been intended to fill it to a depth of 15 feet with water—the overflow level.

Calculation of the Stresses on the Tank.

The actual stresses on the structure are somewhat complicated in any case, and are rendered more so in this instance by the introduction of redundant ties in various directions. But it may be stated at once that the two horizontal ties in an area of 32 ft. by 15 ft. = 480 square feet of cast-iron plate, are too far apart to render any real assistance to the tank beyond slightly stiffening the structure. The cast-iron plates would bulge and burst between these points of support before any great stress could come upon the ties, were it not for the diagonal stays which tie the side plates back to the bottom plates. These are dotted all over the sides, at about 4 feet pitch, and may be considered as resisting practically the whole of the outward water pressure on the sides, the effect of which is to resolve the horizontal outward pressure into a downward thrust on the side plates, exactly equal in magnitude to the outward pressure of water, because the ties are at an angle of 45° (see fig. 4).

The following treatment of the stresses supposes that the vertical pressure is uniformly distributed along the side; but this is not strictly correct. It is at points 4 feet apart, and therefore can only be distributed by inducing diagonal stress on the plates, which, added to the bending stress they have to sustain from the forces acting normal to their surfaces between the points of support, reduces their strength.

Taking a vertical strip of the side, 4 feet wide, corresponding to the width of a plate, and 15 feet deep, we find that we have a total outward pressure of water equal to 250 cwt. If we deduct the 50 cwt. for the proportion of the support derived from horizontal ties which may come upon this strip (which, however, is more than can safely be allowed), we have 200 cwt. left. This horizontal pressure of 200 cwt. is resolved into two directions—viz., an upward pull on the inclined stay or tie, and a downward thrust on the side plates. To this downward thrust must be added the weight of the side plates, stays, bolts, &c., amounting to 22 cwt., and one-half the weight of water on the portion of the bottom which overhangs—say, 16 cwt. So that, summing up, we have a total downward pressure on the side plates at the foot, tending to break the curb off as a cantilever, equal to 238 cwt.—see fig. 4. Is the curb plate, which is only $\frac{7}{8}$-inch thick, capable of resisting such a load?

Neglecting the flanges, the ultimate or breaking strength of a cast-iron cantilever 48 inches wide, $\frac{7}{8}$-inch thick, is only 140 cwt.; or if the flanges be taken into account, the breaking weight would not exceed 160 cwt., which may be seen at a glance is very far short of the actual load which comes upon it when the tank is full of water—viz., 238 cwt.

At the time the tank burst, it was reported to contain about 8 or 9 feet depth of water. The load on the extremity of the cantilever curb due to this would be about 125 cwt., which is not far short of the calculated breaking strength, 140 cwt.

Of course, a factor of safety of at least 4 should have been allowed when designing the tank, taking into consideration its position and the grave results which would follow failure. As it is, the breaking strength is not much more than half of the actual load, or only about one-seventh of the strength it ought to have been.

The above treatment of the stresses assumes that the curb is rigidly fixed to the adjoining bottom plates so as to be capable of acting as a cantilever; but, in all probability, the flange joint, where it unites with the bottom plate, springs slightly under the load, so that the joint at A (figs. 4 and 5) may be considered as "hinged." Probably it is somewhere bordering between the two. But assuming the joint at A as hinged, we have a somewhat different state of things to deal with.

The downward force of, roughly, 200 cwt. can be considered as

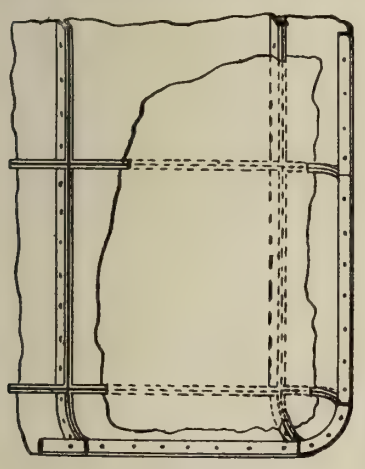


Fig. 1.

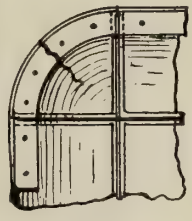


Fig. 3.

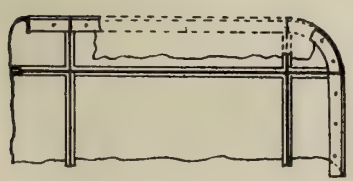


Fig. 2.

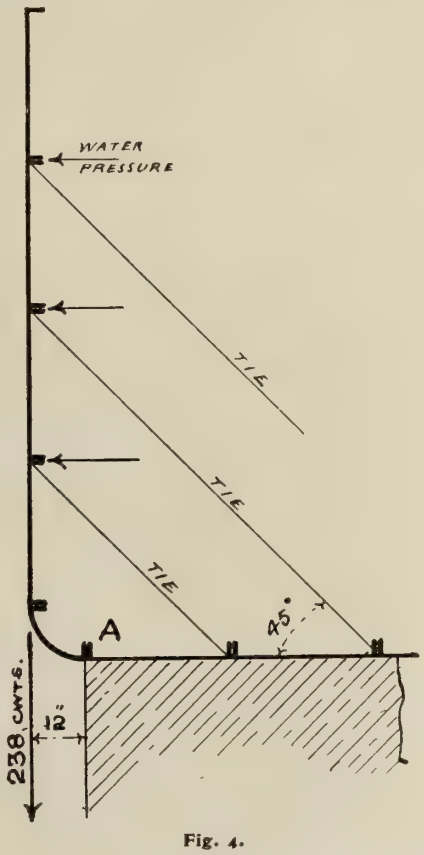


Fig. 4.

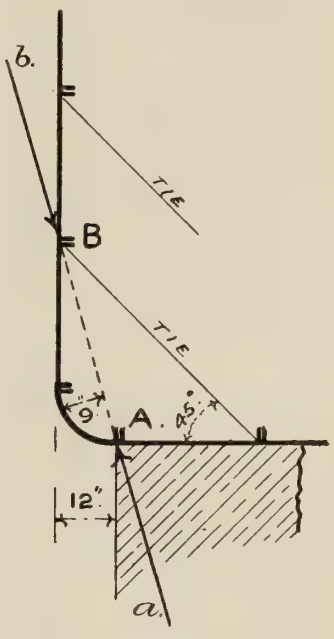


Fig. 5.

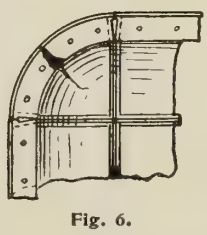


Fig. 6.

concentrated at B (fig. 5), where it is to be split up in two directions—one in the direction of the diagonal stays which are inclined at 45°, and the other in the direction of a line joining the point B with the hinge joint A. It will be found by drawing the diagram to scale that the component B A, acting diagonally and in a downward direction, is equal to 250 cwt., and of course the reaction is equal and opposite. Hence, we have a bent cast-iron plate (fig. 5) acted upon by the force *b* and the reaction *a* tending to bring the two points A and B closer together, and to break the back of the curved curb plate in the bend.

These forces induce a direct compressive stress on the section in addition to a bending stress—both varying in their magnitude according to the position where we determine the stresses.

The maximum distance between the force and the plate, measured at right angles to the direction of the said force, is 9 inches. Hence, the greatest bending moment is 9 × 250. Neglecting the effect of the direct compressive force at this point (which is 250 cwt., or about 6 cwt. per square inch of the section), we have then in effect a cantilever 9 inches long which has to support a load at its extremity of 250 cwt. The breaking load of a cast-iron cantilever 9 inches long, $\frac{7}{8}$ inch plate, 48 inches wide is 188 cwt., or far short of the actual load which comes upon it—viz., 250 cwt.

Looked at in this light (viz., a hinged joint at A), the weakest spot in the curb is nearer the outside of the curb than at A, whereas in the first treatment (viz., a rigid fixed end at A), the weakest point is at A. As a matter of fact, the plate broke away a few inches from A, showing that the actual condition of things is somewhere between the two cases treated, but more inclining to the former than the latter treatment.

After what has been said, it is unnecessary to enter into the question of the strength of the ties or of the individual plates. It has been clearly shown that the structure is radically wrong in general design as well as in detail.

As regards the stiffening ribs on the plates, ribs cast from corner to corner diagonally on plates, however pretty they may look, are bad construction, as they set up contraction strains in the casting when cooling, and their actual ability to do the work required of them is very problematical. Strengthening ribs should run parallel with the flanges. Castings should not be cut up by ribs into triangles for this class of work.

Conclusions.

The practical conclusions to be drawn from a consideration of the foregoing are—

(1) No large and deep tank with curved bottom curb should have diagonal ties, because diagonal ties to be effective must cause downward vertical force on the outer edge exactly equal to the horizontal outward pressure of water on the side, when the ties are at an angle of 45°, as in this case.

(2) Tanks with diagonal ties should always have square curbs and be supported right out to the extreme angle. If curved, horizontal ties alone should be depended upon, and, indeed, this is the better plan even with square curbs where the size does not prohibit it, and for this reason, there are no downward forces induced. The horizontal pressures of water on opposite sides of the tank, being taken direct by the horizontal tie, balance one another. In the present instance, the curb overhangs one foot all round, and thus there is an enormous bending moment introduced on the overhanging plate, which would not exist had the tank been entirely supported from below to its extreme edge.

(3) Again, caulked joints are a disadvantage on curved plates where strength is a desideratum, because in tightening up, the adjoining flanges are thrown into tension on the inside or tensile edge. This is evident when we consider that there is a caulking fillet on the back edge of the flange in the same plane as the plate so as to preserve the caulking space, which of course is not filled up till after all the bolts have been tightened up. Hence, the flanges are free to spring together—drawing, or rather straining, the abutting horizontal flanges, as shown by the exaggerated diagram fig. 6. This subjects the flanges to an initial tensile stress of uncertain magnitude, and which in some cases, added to the contraction stresses which may already be lying dormant in the metal (due to the irregular cooling of the casting from various causes) is sufficient to fracture the flange even before the other forces (due to the weight of the sides, or to water pressure) be added to them. A flange in this way may be a source of weakness rather than strength, because if the flange be cracked, or fractured, the crack being started is likely to extend right across the flange and into the body of the plate with perhaps disastrous results. The flanges are far better to be planed right across, so that they come together iron to iron for their full width. In the present instance, all the four corner plates yielded, although only one corner actually burst out—the adjoining side plates being torn out or fractured at the same time.

In my opinion, the failure was due—

(1) The curb not being supported immediately below the forces acting upon it (as the sides project at least a foot beyond the supporting building), and these forces being of considerable magnitude—inducing not only direct stress, but also an unusually large bending moment, and coming on the curved curb plate which was not in a satisfactory condition to resist such stresses—were no doubt the primary cause of failure.

(2) The employment of diagonal instead of solely horizontal stays, thereby inducing a direct vertical force on the outer edge of the curb, which considerably augmented the bending moment that in any case comes upon it. This last is alone sufficient to account for the failure, as the foregoing calculations prove.

(3) To the curved shape of the corner and curb plates and the caulked joints allowing the flanges to spring when tightening up, thereby throwing the horizontal flanges on the curved corners into tension on the inside edges.

(4) The shape of the corner plates is such as may have caused initial latent strains in the metal when cooling in the foundry; and therefore they were not in good condition to resist further stress.

Recommendations.

As to whether it would be possible or desirable to strengthen up the present tank with ties and stronger plates, &c., so as to make it do the work required of it, I may say that in my opinion the whole tank should be condemned, and no attempt to patch it up or reconstruct it permitted, as even supposing after it was modified and reconstructed it could be shown theoretically capable of resisting the stresses it would in the ordinary way be subjected to, it by no means follows that it would be safe. The fearful shock which it suffered when the burst took place was such as may have started imperceptible cracks and induced permanent strains which only need slight inducement to cause further collapse.

Tanks in such positions, and of such a depth, should not be constructed of cast iron at all, particularly if they are not of cylindrical shape. They should be made of wrought-iron or steel plates, and these should by preference be circular. The strains can then be determined with the greatest nicety, and if properly designed and constructed, absolute safety can be insured. In this instance, I would recommend the erection of a circular steel tank of smaller diameter and increased depth if necessary; the four brick walls of the tower being carried up all round to enclose it, and allowing space between the tank sides and the walls for access for painting, &c. This might easily be made to improve the appearance of the tower, while it would have the advantage of to some extent shielding the water from the effects of temperature—avoiding the extremes of frost and heat. I think the tank might at the same time, with advantage, be covered in.

MR. DUGALD CLERK ON FLAME-ENGINES.

In the "JOURNAL" for the 5th inst., we noticed briefly a lecture on "Flame in Gas and Petrol Motors," recently delivered by Mr. DUGALD CLERK, M.Inst.C.E., at the Royal Institution, of which he is a member. We have since been favoured by the author with the text of his lecture, which we are now able to deal with more fully.

Mr. Clerk began by pointing out that mechanical power can be obtained by flame by four different methods: (1) Filling a vessel or cylinder with a mixture of gas and air and igniting it, causing a slight explosion, and the excess pressure blowing off through a valve; (2) admitting a charge of atmospheric air and inflammable gas or vapour, at atmospheric pressure, into a cylinder containing a piston, cutting off access to the atmosphere and the gas supply, and igniting the mixed charge—a mild explosion following, the pressure rising in the cylinder, and the piston being driven forward to the end of its stroke; (3) sending into a cylinder containing a piston a mixture of inflammable gas and air in a compressed state, and then igniting the mixture; and (4) supplying a cylinder with gas and air under pressure, but igniting the mixture at a grating or gauze as it enters the cylinder, so preventing the pressure from rising above that at which the mixture is admitted. These four modes of action, and the combinations or modifications of them, include all the fundamental methods used in obtaining motive power from flame which have been attempted in the course of the past hundred years. In the early part of the last century, the vacuum methods were favoured. In the year 1820, Rev. W. Cecil, M.A., of Cambridge, in a paper read before the Cambridge Philosophical Society, gave an account of probably the first gas-engine. Six years later, Mr. S. Brown built an engine depending upon the flame vacuum method, which appears to have been the earliest gas-engine ever worked on a considerable scale. This method, however, never really produced a thoroughly commercial motor. Many engines were built on the atmospheric, or non-compression explosion, principle; the most successful one being that of Lenoir. The first and second methods were found disadvantageous; and consequently they are not now used.

In all modern gas or petrol engines, the third method—viz., compression of the charge of inflammable mixture before ignition—is employed. Many attempts to construct engines operating upon this principle were made before success was achieved. One of the earliest feasible compression gas-engines was that described by Mr. William Barnett in 1838, which possessed many of the features of the successful engines of to-day. Later proposals were made for similar engines, both in France and in Germany; but the first inventor to succeed in really overcoming difficulties to a

sufficient extent to produce a commercial engine was the late Dr. Otto, of Deutz. The great majority of modern gas and petrol engines now operate on the Otto cycle, which has many advantages. The charging and discharging of the gases are accomplished easily; the flow of heat through the sides of the cylinder is not too continuous; and the cycle can be operated at very high speeds. Its main disadvantage is the necessity for two complete revolutions for every power impulse. The lecturer said he had devoted much time and experiment to obviating this; and in 1881 he invented a cycle of operations which gave in the same cylinder one power impulse at each revolution. It is now known as the Clerk cycle, and it comes next to the Otto in the order of the number of engines running in various parts of the world. Mr. Clerk exhibited two sections showing the cycle, and also a small engine built to his designs twenty-four years ago. He stated that the German authorities had requested him to present the engine to the Munich Museum, to form a link in the history of the internal combustion motor; and he had consented to do so.

In the early days of gas-engines, great difficulty was found in obtaining regular consecutive ignitions at a sufficiently rapid rate. Lenoir used an electric spark; but it was not then reliable. The early Otto engines had flame ignition; and the igniter served admirably for them—acting usually from 80 to 100 times per minute. When, however, ignition had to be more frequent, as in engines constructed in accordance with the Clerk cycle, the Otto flame was found too slow. The lecturer accordingly produced a modified flame igniter, which he showed in section. It depended on supplying a port with inflammable mixture from the cylinder itself, the gases, being already mixed, contained within themselves sufficient oxygen to support combustion; and accordingly the flame filling the port could be very rapidly ignited—as many as 300 ignitions taking place per minute. These flame igniters gave way to hot-tube igniters about twenty years ago; and now electric forms of ignition have been rendered relatively so perfect that they are fast displacing all tube methods. Mr. Clerk directed special attention to the regularity and the certainty of the various operations—charging, compressing, igniting, expanding, and exhausting—going on in an ordinary stationary gas-engine, and characterized them as truly marvellous, when the difficulties which have been faced and overcome are considered. The gas-engine of medium size runs at about 180 revolutions per minute, or three revolutions in a second. The forward stroke is completed in one-third of a second; that is to say, the intensely hot gases are produced in the cylinder, the pressure attains its maximum, and expansion occurs for the whole power operation, in one-sixth of a second. Ignition of the mixture, from beginning of the explosion to the attainment of the maximum pressure, takes from 1-20th to 1-30th of a second. It is surprising to be able to accomplish these operations with such certainty at these speeds; but the experience with the petrol engine is still more so. In an ordinary four-cylinder motor-car, with the engine running at 1200 revolutions per minute, 2400 explosions take place in that time; the whole of the operations of a complete revolution being performed in the infinitesimal space of 1-20th of a second. "These considerations," said the lecturer, "show what an advance has been made in handling flame as a working fluid during the last thirty years. It has taken more than a hundred years to attain our present knowledge of the means of handling and controlling flame as the working fluid in these engines. But the last thirty years has seen the greatest development, so far as practical matters are concerned; so that now over 2,000,000 H.P. of stationary gas-engines operated by flame are in use in the world." Mr. Clerk at this point of his lecture showed a section of the Diesel engine as an example of the fourth method of obtaining mechanical power by flame.

Though great progress has been made in the practical control and utilization of flame and gaseous explosions for the purpose of producing motive power, the lecturer told his audience that little is as yet known as to the actual properties of the working fluid so utilized. Science still, he says, requires to investigate the properties of gases at high temperatures, in order to fill the gap in our knowledge at the upper end of the scale which Sir James Dewar has so ably filled at the lower end. Consequently, it is not for the present possible to formulate a complete theory of the internal combustion motor, in the absence of knowledge of the properties of the gases constituting its working fluid at the very high temperatures attained. The subject is a difficult one, and involves not only the statical properties of these gases, but requires a knowledge of the conditions and rate of chemical combinations occurring in minute fractions of a second, and the conditions of dissociation of compounds such as carbonic acid and steam at high temperatures under varying temperatures and pressures. MM. Mallard and Le Chatelier and MM. Berthelot and Vieille took up the subject of gaseous explosions, and made experiments with numerous gases and oxygen, and also coal gas and air; but the records examined by the lecturer appeared, he said, to be subjected to very great oscillations of pressure. A few years later, he made a series of experiments with an apparatus of which he exhibited a section; and they showed clearly that the whole of the heat present was not evolved at maximum temperature, assuming the gases to have their ordinary specific heat at the high as well as at the low temperatures. His conclusion was opposed to the views of the French physicists named.

To enable some investigation to be made on different engine cycles, it appeared to the lecturer to be desirable to consider the gas-engine as an air-engine pure and simple, operated with air of constant specific heat—the air being a perfect gas, and the chemical action being assumed as merely a means of heating the air through the desired range of temperature. Calculating on this simplified theory, it became evident that the efficiency to be obtained in an air-engine without heat losses was dependent mainly upon compression. Working out this theory showed that while the utmost that could be theoretically expected from a non-compression engine of the Lenoir type was 22 per cent., compression supplied means of getting theoretical efficiencies of as high as 60 per cent., with practicable ranges of pressures and temperatures. The air standard has proved its utility as a guide to the engineer for a quarter-of-a-century, and is definitely adopted by the Institution of Civil Engineers as the official standard, after exhaustive trials of engines of different sizes.

The simplified theory of the internal-combustion motor has been most useful in pointing out the way to better efficiencies, and with its use these have risen from 16 per cent. in 1882 to a maximum of 37 per cent. in 1906. To enable further progress to be made, however, it is now necessary to know more of the actual properties of the working fluid; and the lecturer, at some length, gave particulars of investigations he had carried out with this object. He said that by the method he adopted he had been able to calculate full-load diagrams taken from the engine, and account for 106 thermal units when the calorimeter showed only 105 to be present. It therefore enables an investigator to determine the apparent specific heat and the heat flow to the cylinder in any engine under working conditions. In this connection, reference was made to some valuable work done by Professor Hopkinson, of Cambridge, in attacking the problem of the loss of heat to the closed vessel; and a section of his apparatus was shown. At present Mr. Clerk has a number of experiments in hand, on engines of different sizes, with his new optical indicator; and he hopes to get accurate figures, both as to specific heat and continuous combustion as well as heat-flow through the cylinder sides.

In conclusion, the lecturer said that engineers were now keenly interested in the progress of knowledge as to the working fluid, because without this knowledge it was impossible to attain the ultimate practicable heat-conversion by means of the internal combustion motor. At present, however, this motor was by far the most efficient means of converting heat into mechanical work. Already 37 per cent. conversion had been achieved; and, so far as present indications pointed, it would be possible to make an engine converting more than 50 per cent. of the whole heat given to it. This result had been arrived at only by the study of the properties of flame, not only on the physical but also on the chemical side; and, on the mechanical side, by using devices of sufficient delicacy and rapidity to deal accurately with large volumes of very difficult working fluid. There was still plenty of room for more investigators—both physicists and chemists—in the promising field of which he had been speaking.

Eastern Counties Gas Managers' Association.—We learn from the Secretary (Mr. Thomas Guyatt) that the next meeting of the Association will be held at Lincoln, on Thursday, the 18th prox.

The Dublin Meeting of the Institution of Gas Engineers.—In view of the fact that the bookings in New York for Ireland for the coming summer are unprecedented, those of our readers who purpose attending the meeting of the Institution of Gas Engineers in Dublin are advised to engage rooms at once. We learn from Mr. Francis T. Cotton, the Secretary of the Alliance and Consumers' Gas Company, that he has already secured at the Shelbourne Hotel as much accommodation as the manager can let him have; and he will be pleased to give assistance to any members who will communicate with him.

Artesian Borings in London.—An artesian well, reaching to a depth of 400 feet from the surface, has been completed at the Bank of England, and springs have been tapped which yield a minimum supply of 150,000 gallons of water per day. The work has been executed by Messrs. C. Isler and Co., of Southwark, by whose improved air-lift pump the supply is raised. The geological formation is the tertiary beds, consisting of alluvial deposits, thick beds of London blue clay, mottled clay, Woolwich and Reading beds, followed by the chalk and flints from which the water supply has been obtained. The average thickness of the beds above the chalk in the City of London is about 230 feet. It is stated that the firm are doing similar work for the Great Eastern Railway Company at their hotel in Liverpool Street.

Manchester and Yorkshire Junior Gas Associations.—Meetings of these Associations will be held on Saturday next. The members of the former will meet at the Manchester School of Technology, Whitworth Street, to hear and discuss a paper by Mr. L. D. Mosley, of Stretford, on "Some Results of Low-Pressure Incandescent Street Lighting." We learn from the Hon. Secretary (Mr. A. L. Holton) that arrangements have been made for a visit to the Brackley Coke-Works on the 20th prox., and for a joint visit with the Yorkshire Junior Association to the Liverpool Gas-Works on Saturday, the 11th of May. The meeting of the Yorkshire Association next Saturday will be held at the Municipal Technical College, Bradford, according to the circular sent out by the Hon. Secretary (Mr. Charles T. B. Roper), when Mr. E. J. Sutcliffe will read a paper on "The Hygienics of the Gas-Stove," and Mr. W. Lawson, of Huddersfield, one on "The Repair of a Gasholder," with illustrations.

NITROGEN IN THE DISTILLATION OF COAL.

In the "JOURNAL" for the 29th of January (p. 270), we noticed briefly a paper, entitled "The Redistribution of the Nitrogen in the Distillation of Coal," read by Mr. JAMES M'LEOD the preceding Tuesday before the Scottish Section of the Society of Chemical Industry. The author, it may be remembered (he was the Chief Chemist at the Provan Gas-Works of the Glasgow Corporation) has just obtained the appointment of Manager of the Kirkintilloch Corporation Gas-Works, in succession to Mr. W. Wilson. He is also President of the Western District Section of the Scottish Junior Gas Association, and a Fellow of the Institute of Chemistry. Special interest, therefore, attaches to his paper, the text of which we give, from the current number of the "Journal" of the Society to whom it was presented.

Within the past decade, enormous strides have been made in the recovery of the nitrogen of coal, in the form of ammonia and of cyanogen, during its destructive distillation. The amount of ammonium sulphate produced in Scotland during 1905 was 17,953 tons from the ammoniacal liquor from gas-works, 19,594 tons from blast-furnaces, 46,344 tons from shale-works, and 7137 tons from producer-gas plants, coke-ovens, &c. This amounts to 91,028 tons. For 1906, Messrs. Bradbury and Hirsch give 95,000 tons as the production for Scotland. The price of ammonium sulphate has ranged from about £11 12s. 6d. to £12 12s. 6d. per ton f.o.b. Hull. The average for the year being £12 0s. 9d., the 95,000 tons represent a value of £1,143,562 10s.

On submitting coal to destructive distillation, the nitrogen present in it is partly retained by the coke and partly eliminated as free nitrogen, which at the moment of liberation probably combines with hydrogen and with carbon to form ammonia and cyanogen respectively, and partly remains as free nitrogen. It also remains combined with carbon and nitrogen to form bases such as pyridine. The aim of this paper is to apportion the amount of the total nitrogen of the coal going to form each of these products.

The proportion of the nitrogen of the coal which goes to form ammonia is not large. Knublauch and also Lundin give this proportion as 12 to 14 per cent. of the total nitrogen. At the Provan Gas-Works during 1906, approximately 227,413 tons of coal were carbonized, and 8,073,161 gallons of ammoniacal liquor were produced. This liquor contained on an average 1·9 per cent. of ammonia, equivalent to 1·56 per cent. of nitrogen. The average of the nitrogen in the 80 coals tested being 1·434 per cent., the 227,413 tons of coal contained 3261·1 tons of nitrogen. Therefore, assuming the specific gravity of the gas liquor to be 1·020, the total nitrogen existing as ammonia works out at 17·10 per cent. This is considerably higher than that found by Knublauch and Lundin.

These estimations of nitrogen were made on average samples of the coals taken from the railway waggons, which were first of all partly emptied by the tipping-machine so as to allow of an inspection of the whole depth of the coal in the waggon. The waggons have end doors, and just enough coal is allowed to run out when the platform is tilted to allow the sampler to get to the bottom of the waggon. The exigencies of the work do not permit of the whole waggon being emptied, broken, and sampled. Some of our coals are not screened as they might be; consequently the percentage of ash is increased by clay and shale, and the amount of nitrogen falls, as a rule, though not always, with the rise in the amount of ash.

The amount of nitrogen varies from 0·915 per cent. (Hattonhill shale) to 1·873 per cent. (Shields Main cannel). It is somewhat remarkable that these two extremes should belong to the same class of coal. Mr. Carrick Anderson found over 2 per cent. in some Scotch coals; but the ash in the samples used would be less, I believe, than the works samples employed in the tests.

As a whole, the coking coals are high in nitrogen; but there are notable exceptions—for instance, Balbardie shows only 0·917 per cent. The percentage of nitrogen in the coal is not a reliable guide as to the amount of ammonia and cyanogen which may be expected, as has been pointed out by Carrick Anderson. The factors governing the amounts of cyanogen and of ammonia produced might be summed up as follows: (1) The physical condition of the coal when introduced into the retort. If the lumps are very small, the heat takes longer to penetrate the whole of the charge, and consequently the products differ. (2) The amount of extraneous moisture that the coal contains. Practical experience shows an increased amount of carbonic acid, sulphuretted hydrogen, tar, and ammonia if the coal is wet. (3) The temperature of the distillation. High heats produce a marked increase in the amount of cyanogen, and also influence the quantity of nitrogen retained by the coke.

Wide differences occur in the percentage of the total nitrogen retained by the coke; the minimum being 30·2 per cent., and the maximum reaching the extraordinary amount of 89·6 per cent.; Wellsgreen cannel giving the former, and Muiravonside coking the latter figure. It does not follow that a high percentage of nitrogen in the coke means a high percentage of the total nitrogen retained by it; this being dependent on another factor—viz., the percentage of the coke on the coal carbonized. Thankerton coke contains 1·936 per cent. This is the highest percentage of nitrogen I have yet found in coke; yet the percentage of the total nitrogen retained by this coke is but 67·8, compared with Muiravonside at 89·6—the quantity of coke from the former coal being 56·7 per cent., and from the latter 69·8 per cent. The amount of nitrogen in the coke varies from 0·575 per cent. in Hattonhill to 1·936 per cent. in Thankerton. Herr Knublauch found in 20 coals from different places, including Scotland, that the total nitrogen remaining in the coke averaged about 50 per cent. The average of the 80 coals tested at Provan works out at 58·3 per cent. of the total nitrogen retained by the coke; the average amount in the coke being 1·374 per cent. The cokes used in these tests were obtained from the coal-testing plant in use at Provan. Owing to our method of carbonizing on the large scale, it would be extremely difficult to obtain always the cokes from given coals carbonized. It is known that the temperature of carbonization has an important bearing on the amount of nitrogen retained by the coke, as also has the rate of heating, especially if the charges are small. The amount of coke obtained by the testing plant agrees closely with that obtained in practice; and I believe that the nitrogen retained will differ but little in the two cases.

The amount of tar produced at Provan during 1906 may be taken as approximately 1,833,104 gallons (of the assumed average specific gravity of 1·17). The amount of nitrogen found in the tar averaged 1·35 per cent. Twelve samples drawn at different times were tested, and the nitrogen varied only from 1·275 to 1·407 per cent. The tests are as follows: 1·307, 1·275, 1·315, 1·400, 1·378, 1·345, 1·407, 1·359, 1·379, 1·401, 1·341, 1·301.

The nitrogen exists in the tar in the form of basic substances; traces of ammonia, pyridine, quinoline, aniline, &c., having been found. Taking the average percentage of nitrogen in the tar as 1·35, and the coal carbonized at 227,413 tons, or the tar produced as 1,833,106 gallons, the total nitrogen remaining in the tar amounts to 3·9 per cent. This is almost double that found by Knublauch.

The nitrogen existing as cyanogen is of very great interest and importance. I cannot give exact figures on this point, as the cyanogen recovery plant at Provan is unable to deal with the whole of the gas produced; and so a considerable proportion of the gas requires to be bye-passed from the plant. The proportion so dealt with cannot be measured. Taking, however, the production of crude cyanide cake at a time when the plant was dealing with all the gas manufactured, I find the gas from 5000 tons of coal produced approximately 6½ tons of crude ferrocyanide cake. Twelve analyses of different samples of this cake, taken at various times, gave the following percentages of sodium ferrocyanide: 44·80, 49·68, 50·95, 54·47, 49·86, 47·74, 40·15, 57·83, 53·09, 45·53, 46·48, 50·18; the average being 49·23 per cent. As 6½ tons of crude cake represent 3·076 tons of sodium ferrocyanide, or 0·8499 ton of nitrogen, this gives 1·18 per cent. of the total nitrogen in the form of cyanogen. Knublauch's figure is somewhat higher than this.

The amount of nitrogen remaining in the gas is determined by the proportions of the total nitrogen distributed among the bodies already discussed. If the nitrogen is estimated by analysis, either directly or indirectly, the result is considerably too high. This is due to the admission into the gas of nitrogen from the atmosphere when the retorts are filled. Carbonization begins at once, and so the gas generated should drive a portion of the air out of the retort before the lid is closed; but the ascension-pipe might still contain some air. Again, when the retort is opened for the purpose of cleaning the ascension-pipe during the process of carbonization, a further amount of air may enter and mix with the gas. If some recent low tests of the nitrogen be taken—viz., 1·7, 2·8, 1·3, 3·2, 2·8, 2·6—the average gives 2·3 per cent. by volume. Taking the weight of a cubic foot of nitrogen, at 60° Fahr. and 30 inches pressure, as 518·85 grains, roughly, the percentage of the total nitrogen works out at 49·3.

Summary of Results.

	Per Cent. of Total Nitrogen.
Nitrogen in the coke	58·3
,, ,, tar	3·9
,, ,, ammoniacal liquor	17·1
,, ,, cyanogen	1·2
,, ,, gas (by difference)	19·5
	100·0

These results, then, point to a considerable amount of atmospheric nitrogen entering the gas. Knublauch states that about 30 per cent. of the total nitrogen goes in. Yet he gives an analysis of gas containing 2·25 per cent. in the crude state; and this would, of course, be higher in the purified gas, and would mean 50 per cent. at least of the total nitrogen. The disturbing factor of the nitrogen getting into the gas from the atmosphere prevents any certainty on this point. Some nitrogen might also enter through cracks in the retorts.

In estimating the nitrogen in the coals, cokes, and tars, the Kjeldahl-Gunning method was used; the oxidations being easily accomplished in this way. Blanks were done with all the reagents used, and the trace of nitrogen so found was deducted from the total.

As the distillations numbered about 380, a rapid method had to be employed. A large tin vessel, cylindrical in shape, and holding from 10 to 12 gallons, was fitted with four condensing-tubes passing through the side near the top and out through the bottom. These tubes were of tin containing some lead, and not of pure tin, as advocated by Dyer. Two of the metal tubes were soon replaced by glass tubes and tried against each other. No loss of

ammonia was observed with the alloyed tubes as compared with the glass tubes. The standard solutions used were decinormal caustic soda and decinormal sulphuric acid. The distillation was carried on until at least 300 c.c. had come over.

The outlet of the condenser-tube passes through a rubber cork, which fits into a suction flask, provided with catch bulbs or thistle funnels fused on to the suction-tube. The funnel was provided with a plug of cotton wool moistened with standard acid. Throughout the tests carried out in this apparatus, in no case was the acid in the wool plug neutralized, even where an insufficiency of acid was present in the flask—showing that all the ammonia had dissolved in the water of condensation. The method used for determining the cyanogen in the crude cake was the usual iron process; I may, however, add that the Feld method is certainly much easier to work.

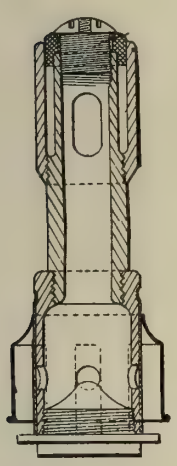
For the nitrogen in the gas, indirect estimation was used in the Orsat-Muencke apparatus. This apparatus has limitations as to accuracy, but it has strong advantages. It is easily handled, clean, not wasteful of chemicals, and extremely rapid. I have done a complete analysis of coal gas, including three explosions, in 44 minutes; and this time might be shortened a little with two absolutely fresh solutions of cuprous chloride. The absorption of carbon monoxide is the weakest point of the Orsat apparatus, as shaking to ensure rapid absorption is not readily done. The new apparatus consists of two Orsats joined by a rubber tube, filled in the centre by a glass capillary tube to avoid a wide space. The bulbs in the second portion contain ammoniacal nickel nitrate for the absorption of benzene, fuming sulphuric acid, and water in the first, second, and third bulbs respectively. A mercury explosion pipette takes the place of the fourth bulb. About 10 c.c. of residual gas, after removing the absorbable constituents, is mixed with about 90 c.c. of air passed into the explosion bulb, passed back again to mix it, and then exploded by a coil and storage cell. The explosions take place very quietly and with certainty. The rest of the procedure is as usual.

REGISTER OF PATENTS.

High-Pressure Atmospheric Gas-Burner.

SENSENSCHMIDT, M., of Frankfort-on-Main,

No. 21,148; Sept. 24, 1906. Date claimed under International Convention, Sept. 23, 1905.



Sensenschmidt's High-Pressure Burner.

This invention relates to high-pressure bunsen burners of the type in which a thick-walled bunsen tube has its upper end provided with one or more apertures to allow the gas to pass into a sleeve surrounding the bunsen tube and closed by a vertically adjustable gauze net.

The particular means for adjusting and securing the gauze net in position is shown in the engraving. Upon the burner-nozzle is screwed a mixing-chamber which carries a thick-walled bunsen tube, the top of which is closed by a screw. Between the screw and the nut above, there is firmly clamped a net of nickel wire surrounded by the burner-head. The bunsen tube is furnished at its upper end with two or more apertures, through which the gas under pressure enters the burner-head.

When the burner is in operation, the gas, flowing under pressure out of the nozzle, is mixed with fresh air in the mixing-chamber above and in the tube, and is then distributed uniformly in the burner-head, which it enters through the apertures shown. If, now, the screw above is screwed out further, so as to expose more of the surface of the gauze net, the flame assumes the shape of a small elongated cone; while if the gauze net is lowered in the burner-head, the bunsen flame is broadened.

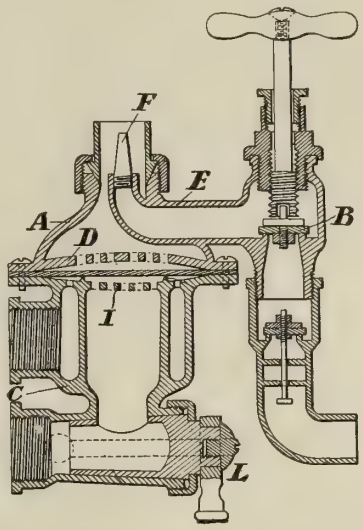
Controlling Gas Supply to Water-Heaters.

KRUEL, F., of Kaiserslautern, Germany.

No. 20,734; Sept. 18, 1906. Date claimed under International Convention, Sept. 29, 1905.

The arrangement shown consists of the upper part A, the shape of an inverted funnel, the mouth of which is covered by an inwardly curved plate D, in which are perforations. The funnel is in communication with the union of the water-valve with the water-heater. The water inlet pipe E terminates at one end in a nozzle F, and at the other end in the water-valve B. The gas-supply chamber C consists of an inner and outer chamber; and above is an inwardly curved plate I, perforated, and having on its upper surface an annular flange coincident with the wall of the inner chamber. The lower part of the supply chamber is closed by a main cock L, with a pilot-jet for ignition. These parts are of known construction; and the pilot-cock is so arranged that when it is closed its handle prevents the movement of the main cock.

Between the two curved plates D and I is a diaphragm, in contact on one side with the water and on the other side with the gas. When the water-valve is closed, the membrane under pressure of the water in the heater is forced down on to the annular flange, and completely cuts off the gas-supply; but when the water-valve is open, the water flowing into the heater through the nozzle F creates a suction which raises the membrane, so that gas can flow freely from the inner into the outer chamber and thence to the burner. The invention, therefore, permits



Kruel's Gas Supply Controller for Water-Heaters.

the actuation of the diaphragm that cuts off the gas to be "dependent solely upon the physical properties of the water, so that mechanical devices—such as springs, rods, or the like—are not necessary."

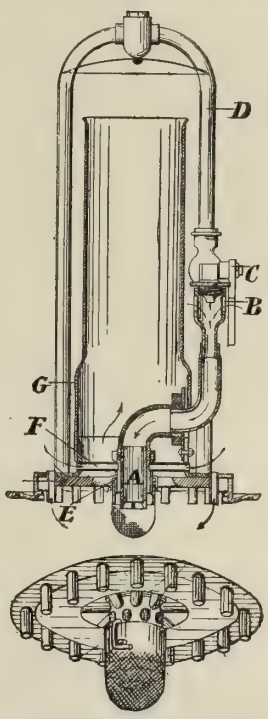
High-Pressure Lamp with Inverted Mantle.

BRILLOUIN, H., of Paris.

No. 22,308; Oct. 9, 1906. Date claimed under International Convention, Oct. 9, 1905.

This high-pressure incandescent lamp with inverted mantle is represented in vertical section and perspective, so far as the burner itself is concerned.

The burner A is united by two elbows to the ordinary bunsen burner B close to the cock C on the column D of the gas-pipe. The burner is surrounded by a ring E, at the interior of which opens out a series of horizontal tubes F radiating exteriorly and crossing the base



Brillouin's High-Pressure Inverted Lamp.

of the chimney G. Between and below these tubes holes are provided. The burner is composed of a tube in which rests, at the bottom of the bore, a metallic screen maintained by a cross bar at a certain distance from the orifice of the burner, which is bored slightly conically.

The gas, on reaching the bunsen burner, passes through the double elbow to the burner and through the metallic screen, which is held at a sufficient distance from the orifice of the burner that it cannot in any case be made red hot under the action of the heat of the burning gas. The exterior air penetrates through the horizontal tubes F and cools the top of the burner, "producing complete combustion in the mantle."

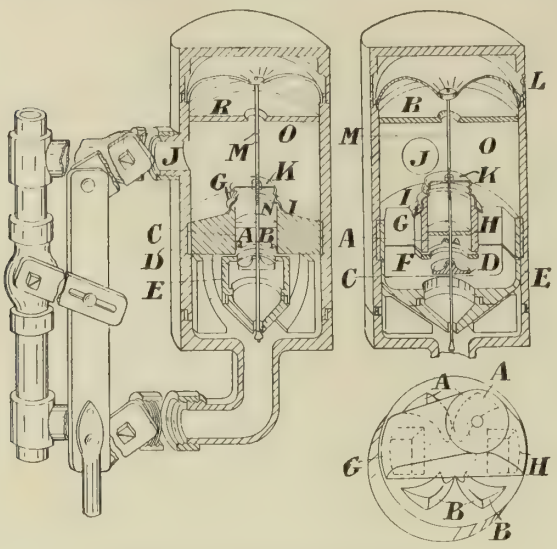
Gas-Pressure Regulator.

JASPERSEN, H. C. M., of Hamburg.

No. 3290; Feb. 10, 1906.

The patentee remarks that "there are several kinds of regulators for gas-pressure in existence; but they are all subject to disturbances by the rising of the water and the gas current striking against the angular

walls—the former resulting in a diminution of the supply of gas, and possibly complete obstruction of the regulator, and the latter preventing the force of the current being employed to close a valve on an increased consumption of gas." These disadvantages are said not to exist in the regulator now to be described.



Jaspersen's Gas-Pressure Regulator.

The unregulated gas flows through the channels A and B into the supply chamber C round the valve D into the lower discharge-chamber F, which is shut off from the unregulated gas by the partition E. From the latter chamber it passes, as regulated gas, through the spaces G and H into the space O, and then, through J, to the gas-jet in use.

The water generated flows, in consequence of the slanting surface of I, along the outer sides of the channels H and G into the lower space F, and from here, through the small opening P, into the gas-meter. This has the advantage of allowing the water to run off without coming into contact with the regulating valve which admits the gas.

At the point where the gas enters the regulator, four conical channels cause it to be at once split up and led into the openings A and B without diminishing the force of the current.

Above the supply chamber C is a membrane K, to shut off the regulated gas from the unregulated. This works like an accordion, and prevents the fluctuations of the unregulated gas from influencing the regulating valve which admits the gas.

The regulator works as follows: When the gas has passed through the four channels named, the spaces C and F, and reached the space O through the openings G and H, while streaming out towards the gas-jet, it exercises a continual pressure against the membrane, the result of which is that the valves N and D are kept in a fixed position. On an increased consumption of gas, the membrane falls in consequence of the diminished pressure, and the valve D opens and allows an increased entrance of gas. On the other hand, when the consumption is lessened, the membrane is raised by the increased pressure, and the valve D approaches the space E, whereby the gas supply is decreased—only sufficient being passed through to supply the gas-jet in use. When the membrane is no longer tight and there is an escape of gas, the valve S begins to sink. At the same time the valve N sinks and (gas being burnt) comes into contact with the gas current from the four channels which immediately closes the valve. This occasions the valve S to close completely and make the space R gas-tight.

Incandescent Mantles.

Terrell, T., of New Court, Temple.

No. 6814; March 21, 1906.

The object of this invention is to produce a mantle which can be sold in the unburnt state, and so manufactured that the purchaser can apply it to an ordinary burner and incinerate it, *in situ*, for himself.

The invention, broadly, consists in producing an unburnt mantle containing a high proportion of oxides of the illuminating metals and coating it with an inflammable stiffening substance (collodion). And, in this connection, the patentee points out that a process of producing unburnt mantles or fabric containing the necessary high proportion of oxides of the illuminating metals has been described in his patent No. 11,042 of 1902; while another process of producing unburnt mantles containing a high proportion of oxides of the illuminating metals is described in the Plaissetty patent No. 20,747 of 1901. He describes the present invention as worked in accordance with his own patent of 1902.

The fabric is knitted either before or after impregnation. It is then immersed in hot water, or steamed, with the object of setting the stitches. The fabric is next cut into suitable lengths according to the shape and size of the mantles required. The heads are then sewn in, and a strengthening fluid applied to the top. So far the process is precisely similar to the earlier one. The mantles are now coated with a readily inflammable stiffening substance—for example, dipped in an ordinary solution of collodion, or starch may be used instead. The mantle is next partially dried, and is then placed on a hot former—preferably heated internally by steam—of a diameter suitable to the burner top on which the mantle is subsequently to be used.

A mantle properly made by the 1902 process shrinks on incineration about 35 per cent. in length and 35 per cent. in diameter; so that the unburnt mantle should be made about 55 per cent. longer than is required after burning. Thus in producing mantles for an ordinary "C" burner—having a burner top of 1 inch in diameter—the former upon which the mantles are made should be slightly over 1½ inches in diameter.

The hot former will completely dry and set the collodion and fix the threads of the mantle in their position; so that the mantle can be folded and packed without risk of injury or change in size or shape.

When it is desired to use the mantle, it is placed on an ordinary burner in the usual way, and, of course, it is much too large. As it is necessary to ensure uniform incineration, a light must be applied to the top of the mantle, when the collodion rapidly catches fire and burns downwards completely round the mantle. The organic matter is thus burnt out of the mantle, and when it is burnt to the bottom it will have shrunk nearly to its final dimensions. The gas is then turned on low and lit so as to burn off any residual carbonaceous matter. This takes a few seconds; and, when accomplished, the gas is turned on full, when the incinerated mantle acts in the usual way.

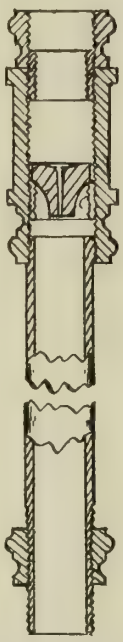
Mantles made by this process are said to last much longer than ordinary mantles; are easy of transport; and are very regular in their shape and size. Further, the mantles shape themselves to the flame upon which they are placed in such a way that every part will be rendered incandescent although the flame may not be perfectly uniform.

Inverted Incandescent Gas Fittings.

Hoare, G. C., and Sheat, H. L., of Harringay.

No. 6086; March 13, 1906.

This invention, in which the gas supply to incandescent lamps is first throttled or wire-drawn and then expanded and heated on its way to the burner by contact with surfaces heated by the burner, consists in carrying the inverted lamp on the lower end of a comparatively long gas-supply pipe or chamber, while the upper end of the pipe or chamber is made to contain a perforated plug or disc for throttling the gas, which then expands into the gas-supply pipe and is heated therefrom on its way to the burner.



Hoare and Sheat's Inverted Burner.

As shown, there is a tube of suitable length and diameter, to the lower end of which is attached the burner. At the opposite end is a socket having a seating, on which rests a plug or disc (perforated from end to end with a comparatively fine hole or with several holes), of conical form, with its upper and larger end dished. It is kept in place by a tubular thimble externally screw-threaded for attachment to the socket, and internally screw-threaded for attachment to a flexible tube or fitting through which the gas is supplied. The effect of the fitting is that a comparatively long chamber is interposed between a restricted or throttled gas inlet and the burner, so that the gas is expanded by the heat of the burner itself, with the result that there is "considerable increase of light with an entire absence of carbonization."

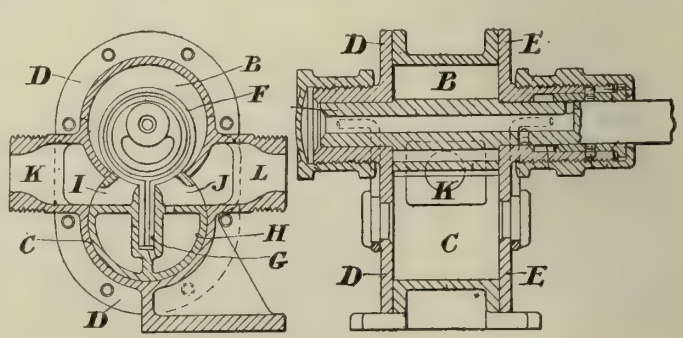
The capacity or length and bore of the tube, and the dimensions of the plug or disc, depend on the gas pressure and the particular type of burner used; but with an inverted burner of the ordinary kind and size, the tube (the patentees say) may be about 8 inches in length and ⅜ inch bore—the perforation in the plug or disc being (say) about 1-32nd inch in diameter.

Rotary Exhauster and Blower.

Lamplough, F., and the Albany Manufacturing Company, Limited, of Willesden.

No. 10,968; May 10, 1906.

As shown, the casing consists of a part having two cylindrical spaces B C and of two end covers D E. In the cylindrical space B is located the piston F, while in the cylindrical space C is an oscillating piston H, serving as a valve and as a guide to the tongue-piece G extending from the piston F. The cylinder B is open along a peripheral line, and a portion of the oscillating piston H fits within this opening. The oscillating piston H has inlet and outlets ports I J communicating with the interior of the cylinder B and with the inlet and outlet passages K L of



Lamplough's Rotary Exhauster and Blower.

the casing, which latter passages are formed on a line intermediate of the two cylindrical spaces B C. The end covers D E are provided with bearings to receive a driving shaft passing through the centre of the cylinder B. On the shaft is an eccentric, on which is mounted the piston F, which latter is concentric with the eccentric, and is in contact

with the interior of the pump cylinder B on a line across its periphery and at its ends.

The action is as follows: The periphery of the pump piston F, when carried round by the eccentric, sweeps the walls of the cylinder B; the tongue-piece G fitting within, and travelling up and down in, a guide formed in the oscillating piston H. When the piston F is at its lowest position, it rests within a seat in the oscillating piston H, which is then in its central position, and closes the ports I J. On the further motion of the pump piston F, it, by means of the tongue-piece G, rocks the oscillating piston H so as to open communication between the ports I J and the interior of the cylinder—thus commencing a fresh delivery and suction stroke.

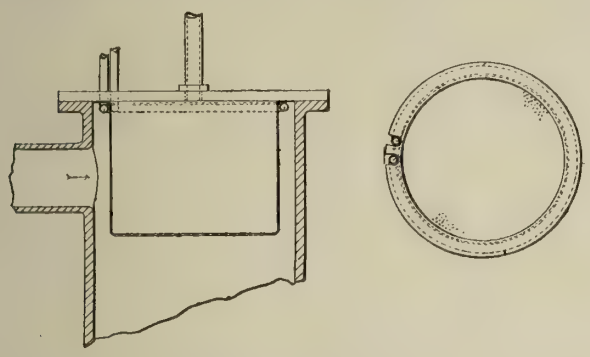
Purifying Device for Suction and Other Gas Plant.

FARNHAM, R. V., Wemyss Bay.

No. 11,213; May 14, 1906.

This invention has for its object to improve gas scrubbing or purifying apparatus "whereby it is rendered more effective, and obviates the necessity for constant cleaning."

There is the ordinary form of apparatus, and within the purifying tank is the usual water-holding cylinder or other receptacle having its lower end perforated. Through the perforations the water, acting as the washing agent (before the gas passes through the coke), issues in the usual way, and acts on the entering gas to wash it.



Farnham's Gas-Purifying Device.

The gas on entering the scrubbing tank strikes against the outer shell of the receptacle and deposits thereon tarry and other matters until in course of time a thick coating of such matter is deposited. Owing to the position of the water receptacle within the coke-containing cylinder, the gas-inlet would, in the ordinary way, become more or less closed, so as to effect a great reduction in the amount of gas entering the purifying tank and so compel the water receptacle to be removed and cleaned on its outside.

The present invention, however, which obviates this disadvantage, consists in providing around the outside of that end of the water-cylinder which is secured to the cover of the purifying tank, a perforated tube supplied with water from any convenient source—the perforations being in such position in respect to the periphery of the water tank that the water issuing from the perforations does not splash back, but each stream mingles with its neighbour, thereby forming a water ring or band which thereafter flows down the outside of the water receptacle, absolutely preventing the deposit of tarry or other matters. The water ultimately joins the spray issuing from the perforated bottom of the water-tank. By this means "the formation of tarry and sooty matters upon the water receptacle, together with their attendant detrimental effect upon the quantity of the gas entering the scrubbing tank, is obviated; and a constant volume of gas is obtained."

Shutting Off the Supply of Gas in Case of Fire.

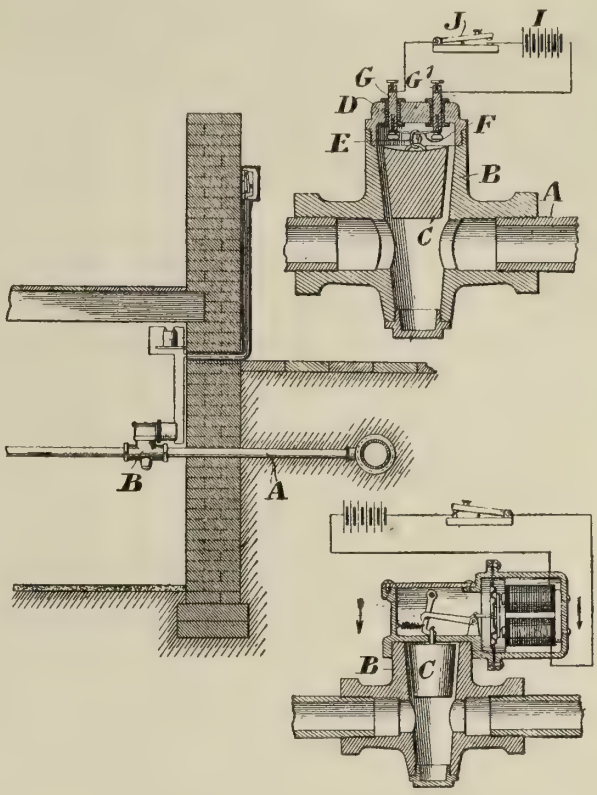
JENCZEWSKY, A. W., of Chicago, U.S.A.

No. 13,670; June 14, 1906.

This invention relates to electrically actuated valves for gas-supply pipes for cutting off the gas in case a fire occurs within the building wherein the pipe is laid—more particularly to that type of such device wherein a valve is normally held suspended in a valve casing by means which are released on the completion of an electric circuit. The patentee not only aims at improving the construction and operation of such devices, but he combines therewith means for causing the cut-off valve to be automatically operated by the heat alone in case of failure in the operation of the electric means.

A is a gas-supply pipe leading from a main, and B a valve casing which connects two parts of the pipe, and having a vertically arranged valve-chamber, the lower part of which forms a tapered valve seat, with lateral ports to communicate with the parts of the pipe A. C is a valve plug, of conical form, adapted to fit the valve seat in such manner as to close the ports, or be lifted away from the seat to open the ports. The valve plug tends to assume its closed position by gravity. D is a screw-cap which closes the top of the valve-chamber. Supporting devices for holding the valve plug in its elevated position consist of a loop on the upper end of the plug, a link E, which is engaged with the loop, and a fuse-wire F, which is attached at its ends to insulated supports and engages between its ends with the link E. The supports for the ends of the fuse-wire consist of two rods G G^1, which extend through the cap D, and are insulated from it by bushings of insulated material. The rods G G^1 and the fuse-wire F are connected with each other, and an electric battery I by wires forming an electric circuit, with a switch J for closing it located outside of the building (say) in a box on the exterior, which may be opened by firemen for the purpose of closing the switch and releasing the valve closure.

The valve will not only be adapted for the release of the closure and closing of the valve through the fusing of the wire F by an electric current, but also automatically by the presence of the heat in the immediate neighbourhood of the valve sufficient to melt it.



Jenczewsky's Gas Cut-Off Apparatus.

To further insure the prompt closing of the valve in case of fire in its immediate neighbourhood, the supporting link E may be made of readily fusible metal—such as lead. Moreover, if the link be made of fusible metal, the fuse-wire F need not necessarily be of such character as to be actually fused or melted by the current passing through it, but may consist of a wire having such resistance to the passage of the current that it will be heated by the current sufficiently to melt the fusible supporting member E.

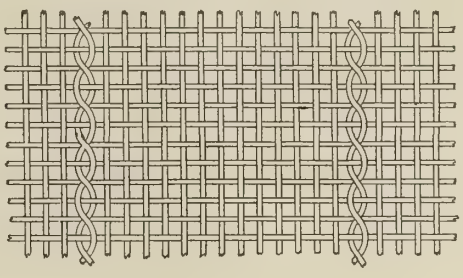
The lower form of electrically operated safety-valve allows of the release of the closure by the action of an electro-magnet.

Incandescence Mantles.

WHEATLEY, W. H.; a communication from FROWEIN and WIESCHER, of Barmen, Germany.

No. 13,681; June 14, 1906.

These incandescence mantles are made on a bar or ribbon loom with a jacquard machine and furnished with interwoven spiral threads. This interweaving, the patentees claim, enables the fabric of the mantle to be made more loosely—that is to say, the mesh openings to be made



Frowein and Wiescher's Mantle.

considerably larger; and since the illuminating effect depends on the size of the mesh openings, the mantle has a considerably greater illuminating effect than mantles hitherto known in the market—an "advantage which is not to be under estimated in view of the fact that, notwithstanding the large meshes, the solidity of the mantle is preserved by the spiral threads."

Generating Steam for Conversion into Water Gas in Producer Plants.

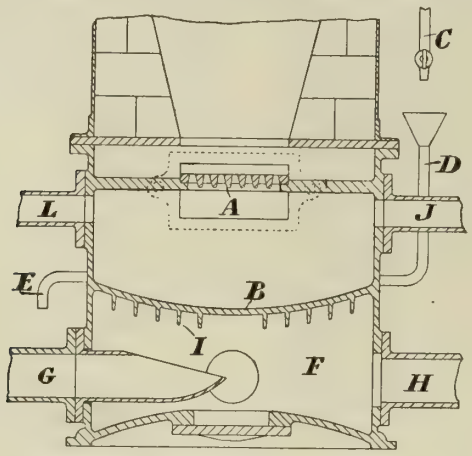
SELLERS, F., CAPEL, C., and WALLIS, F. G., of Dalston Lane, N.E.

No. 19,115; Aug. 27, 1906.

In suction and pressure gas producer plants, it is necessary and advantageous, the patentees point out, to introduce a certain proportion of water gas into the producer gas, for enrichment purposes, by passing steam through the producer. Hitherto the generation of steam for this purpose has been effected in various ways—as by heating water contained in a pan arranged beneath the fire-grate of the producer by the radiated heat and hot droppings from the grate; also by heating water fed to a plate arranged beneath the fire-grate of the producer by both the radiated heat from the grate and by hot gas drawn direct from the top of the producer through a chamber of space beneath; also (as described in patent No. 4087 of 1905) by heating water in a container

separate from the producer by means of the hot exhaust gases from the engine, and conveying the steam thus generated along a conduit to beneath the fire-grate.

The object of the present invention is to ensure the generation of steam "with great rapidity," by subjecting water contained in a pan or steam-generator arranged beneath the fire-grate to the simultaneous conjoint action both of the radiated heat from the fire-grate and the conducted heat from the exhaust gases of the engine. Modifications in details are described; but one only need be here referred to.



Capel's Steam Generator for Gas Producer Plants.

Beneath the fire-grate A is a shallow pan B, form ng the bottom of the ash-pit, and kept supplied with water by the drip cock C and inlet pipe D, and having an overflow pipe E so that a constant level may be maintained. The hot exhaust gases from the engine are led to the chamber F at the bottom of the producer by a pipe or conduit G, the discharge end of which is so arranged as to cause the hot exhaust gases to impinge directly upon the under-surface of the pan B. The gases leave the chamber F by the pipe H, and pass to the atmosphere through a suitable silencer. There are projecting ribs on the underside of the pan B, arranged with a view to increasing its conducting surface. The water in the pan receives the radiated heat and hot droppings from the grate, and also the conducted heat from the exhaust gases—the effect of this simultaneous conjoint heating being, it is said, "to generate steam in a very rapid manner;" the steam then passing through the producer and being converted into water gas in the ordinary way.

APPLICATIONS FOR LETTERS PATENT.

5139.—Hinton, E., and Andrews, F. A., "Incandescent burners." March 4.
5147.—Alderson, E., "Mantle protector." March 4.
5171.—Wagmüller, E., "Gas flash-light." March 4.
5234.—Barbier, P., and St. Laurent, E. J. S. de, "Mantles." March 4.
5242.—Ewart and Son, Ltd., and Ewart, G. H., "Geysers." March 4.
5244.—Westover, H. J., "Analysis of gases." March 4.
5288.—Hope, J. H., Ritson, T. N., and Moody, C. A., "Boxes for stopcocks, water meters, and the like." March 5.
5320.—Morrison, A., "Anti-vibrator." March 5.
5342.—Onslow, A. W., "Gas-furnaces." March 5.
5344.—Newlyn, H. N. G., "Sealing of pipes." March 5.
5368.—Bodden, R., "Inverted globes." March 6.
5369.—Hutchinson, C. H. & B. G., "Coin-freed meters." March 6.
5391.—Sutton, C. J., and Rudd, J., "Incandescent burners." March 6.
5400.—Calvert, G., "Gas-burners." March 6.
5419.—Schulthess, W., "Controlling the flow of fluid in pipes." March 6.
5421.—Tourtel, J. M., and Mealing, W. R., "Automatically lighting and extinguishing gas." March 6.
5459.—Atkinson, E. E. & W., "Utilization of heat generated in internal combustion engines." March 7.
5460.—Evered and Co., Ltd., and Read, E. T., "Bye-pass gas-valves." March 7.
5478.—Hepburn, J., "Automatically lighting and extinguishing gas." March 7.
5594.—Helps, G., "Bunsen burners." March 8.
5651.—Raybould, A., "Gas-fittings." March 8.
5667.—Schwartz, J., "Mantle suspenders." March 8.
5700.—Helps, G., "Bunsen burners." March 9.
5730.—Norden, J., "Incandescent lamps." March 9.

Quality of the Gas at Sevenoaks.—Complaints of "bad gas" at a meeting of the Sevenoaks Urban District Council, drew from Mr. Laurie, who is a Director of the Gas Company, the statement that they were fully alive to the fact that the quality had not been up to the standard. The amount of sulphur in the gas was attributable to a certain coal the Company had been advised to use. They had, however, now taken steps to remedy the matter by mixing the coal in question with other. The pressure was at all times in excess of the legal requirements. The district had grown considerably; and everything was being done by the Directors to meet the demand. Dr. Marriott welcomed Mr. Laurie's remarks, but said that they were not enough to satisfy him. If the Company were doing everything they could for the town, they would never have allowed so much sulphur to get into the gas. The statute was doubtless passed forty or fifty years ago; but it would not do for the present day. The pressure probably was quite up to the standard; but what they wanted was pure gas.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

High and Low Grade Gas.

Sir,—For more than twenty years, "in season and out of season," I continued to advocate in Scotland the supplying of illuminating gas of a much lower quality than was then in use—say, 26-candle power. I advocated 18-candle power; and records show how unanimously the voices of gas engineers and managers were raised against such a change—many advocating an increase in quality. Since the universal adoption of the incandescent gas-burner, I can see no good reason at all why a much lower grade—say, 10-candle power—should not become a standard quality.

The gas I am using here to-night is not ½-candle power at 5 cubic feet per hour with the mantle off the burner; it gives a flame similar to that of the bunsen burner. With the mantle in position, I cannot look on the mantle at a few feet distance, it is so brilliant, requiring a few minutes to allow of the effect on the retina of the eye to readjust itself to the lesser, but good, light within the room before I can see anything in it. I use petrol air gas.

Your correspondent Mr. J. W. Thompson, writing under the above heading in your issue for the 12th inst., suggests that it is much wiser not to mix gases; and he claims to be quite a "judicious toper." It occurs to me to mention the following circumstance in order to put a question later. Many years ago, I was consulted by a gas company in a small town in Scotland who desired to have my opinion as to whether it would be judicious for them to instal plant to cost (say) £400, wherewith to manufacture oil gas from crude paraffin oil, and to pass it into the gasholders along with coal gas from the retorts. I strenuously advised the company not to erect the plant. A year afterwards, I received from the secretary a long letter, the gist of which was that they had carbonized the same quantity of coals during the twelve months just ended as during the previous year; that the volume of gas accounted for by meters was the same as in the former year; that they did erect the oil-gas plant, and had carbonized (?) more than 2000 gallons of oil; and had spent upwards of £400 of capital; and for capital, oil, and labour there was not a brass farthing to their credit.

Well, as to my question. For many years past it has been to me a very great surprise to learn of certain gas companies in Scotland using quantities of benzene or petrol with the intention of enriching the gas. So long as enormous supplies of excellent gas-making splint coals are available in Scotland, giving gas of 20-candle power, I could not see where "enrichment" came in. That was when the proper-sized modern good burners for flat flames were, or should have been, used. But now that incandescent lighting is in general use, the enriching of coal gas at present seems to me to be utter madness; and I question very much if any one of the users of the enriching (?) fluid ever made a test of the gas during the winter months, as it passed from the holders or from the street mains to the consumers, to ascertain whether enrichment had really occurred, for I should not be surprised to learn that the illuminating power had been reduced. I say this from tests made by myself in the eighties. If reduced, then we have something to account for the purchases of cannel coal or shale to keep up an illuminating power absolutely wasteful. It is not gas which now gives us light, but mantles. Who then get the benefit of the use of oil by the small gas company, and of oil and cannel coals by the larger companies? The tar distiller.

Perhaps one or two of the gas managers who still employ benzene or petrol to enrich may be able, through your columns, to give substantial reasons for its use.

William Key.

St. Cyr. Ceres, Fife, March 14, 1907.

"Tit-Bits" for Gas Engineers.

Sir,—After the favourable reviews of the "Gas Engineer's Pocket-Book" which have appeared in certain periodicals, I was pleased to read the criticism made in the "Journal" of yesterday's date, under the above heading. I had occasion to purchase the volume in question about two weeks ago, and, in addition to the "Tit-Bits" indicated in your article, the following strike me as being worthy of notice.

The table of relative electrical conductivities on p. 98 is curiously at variance with modern knowledge, particularly with regard to copper and platinum. On p. 322, comium is stated to melt at 21·4° C., whereas it is one of the most refractory metals known. In another place (p. 334), nitroglycerine is stated to melt at 7° C.—the correct value being about − 20° C.; and in yet another (p. 353), ethane is said to boil at "89·5° at 735 mm. pressure," whereas its boiling-point at atmospheric pressure is − 93° C. This inexactitude may possibly be due to a "clerical error," as may that on p. 325, in which it is stated that the olefine series is a saturated series.

The author's knowledge of pyrometers is distinctly antiquated, if it is to be judged by the matter on p. 249. The Lamy pyrometer is there said to be one of the best, and thermo-electric, resistance, and radiation pyrometers are not even mentioned. But this is scarcely to be wondered at, considering the devices described on pp. 231 and 232 for indicating temperature rises in stacked coal.

The author's "quotation" on p. 301 to explain the formation of naphthalene in mains is, to say the least, ambiguous; and a comparison between the last two tables on p. 338, not to mention numerous other instances, is almost worth making.

The criticism might be extended indefinitely; but it would be trespassing on your space to enlarge on the subject. Nevertheless I cannot resist drawing attention to the statement on p. 357, that the sodium flame is blue-green; to the limits of engine efficiencies on p. 401 (Oh, that they ever approached such desirable efficiencies!); to the formula for aniline on p. 409; and to the combining volumes of ammonia and hydrogen sulphide on p. 263.

James F. Ronca.

174, *Elms Road, Clapham Common, S.W.*,
March 13, 1907.

Gas-Governors.

SIR,—Kindly permit me space to correct a misconception regarding the form of my gas-governor valve.

Mr. Lill, of Edinburgh, read a paper on "Gas-Governors" to the members of the Eastern District Section of the Scottish Junior Gas Association, and, as reported in your issue of the 12th inst. (p. 683), he therein erroneously described the valve of my governor as being "of cylindrical shape, closed in the bottom, and having a series of slots cut around its circumference." My governor is the only one the valve of which does not have a bottom; and it would be correctly described as being simply a cylinder open at both ends, and suspended vertically by a rod. A 12-inch governor valve would thus be roughly represented by a suitable length cut from a 12-inch cast-iron pipe. There are no slots whatever in the valve; but the surrounding casing—the chief purpose of which is to carry the upper valve-seat—has openings to pass the gas through. These may be of any form—tapered, inverted V shape, or vertical parallel slots.

My cylindrical bottomless valve has been applied successfully in several ways, such as a water-pressure reducing valve, for which purpose it is most delicate in action. Its simplicity cannot be further simplified, and it is cheapest to manufacture. Like my gas-governor, it prevents concussions from passing it. Their enormous force is used to end themselves by dividing to each side of the valve, meeting, and being spent in the chamber round the exterior of the valve on its pressure side; while the valve itself as instantly cuts off the extra pressure from the outflow.

My gas-governor valve entirely prevents oscillations of pressure which may occur on the pressure side or inlet side of the valve—frequently caused by the gales of wind pressure on the gasholders—from being registered on the tell-tale self-registering index. No gas-governor I ever saw so completely refuses to register anything but a perfectly straight line from the moment an attendant has altered and set the desired pressure by an applied or withdrawn load. It maintains steadily, under all fluctuations of initial pressure or consumption, the one unvarying pressure it was set to maintain.

My cylindrical bottomless valve has, among other uses, been applied to compensating governors in exhauster-houses, &c. WILLIAM KEY.

109, *Hope Street, Glasgow, March* 14, 1907.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills presented and read the first time: Aberdeen Corporation Bill, Glasgow Corporation Bill, Renfrewshire Upper District (Eastwood and Mearns) Water Bill.

Bill reported, with amendments: Newquay and District Water Bill.

The South Lincolnshire Water Bill has been withdrawn.

Petitions have been presented against the following Bills: Aberdeen Corporation Bill, by the Aberdeen County Council; Glasgow Corporation Bill, by the Lanark and Renfrew County Councils, and owners of houses and property within the limits of supply of the Busby Water Company; Renfrewshire Upper District (Eastwood and Mearns) Water Bill, by the Busby Water Company, owners of houses and property within the Company's limits of supply, the Lanark County Council, and the Newton Mearns Water Supply Committee and others.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Grays and Tilbury Gas Bill.

Bills reported, with amendments: Annfield Plain and District Gas Bill, Basingstoke Gas Bill, Bude Gas Bill, Falmouth Gas Bill, Gas Companies (Removal of Sulphur Restrictions) Bill, Llandrindod Wells Gas Bill.

MITCHAM AND WIMBLEDON DISTRICT GAS BILL.

House of Commons Committee.—Thursday, March 14.

(*Before Sir* FREDERICK BANBURY, *Chairman, Mr.* FIENNES, *Mr.* RAPHAEL, *and Mr.* MOND.)

This Bill seeks authority to construct new works, to raise additional capital, and to convert existing capital.

Mr. BALFOUR BROWNE, K.C., Mr. HONORATUS LLOYD, K.C., Mr. C. C. HUTCHINSON, and Mr. E. J. NALDRETT represented the Mitcham and Wimbledon District Gas Company, the promoters. Five appearances were made against the Bill; the petitioners being represented as follows: The London County Council, Mr. G. J. TALBOT, K.C., and Mr. B. WILLIAMS; the Croydon Rural District Council and the Wimbledon Corporation, the Hon. J. D. FITZGERALD, K.C., and Mr. E. F. VESEY KNOX, K.C.; the Wandsworth Corporation, Mr. T. J. BARNES; and for Mr. George Pitt, Mr. W. H. ELDRIDGE.

Mr. HONORATUS LLOYD, in opening the case for the Bill, said the Mitcham and Wimbledon District Gas Company was a statutory concern supplying gas over an area which included the districts of Wimbledon, Wandsworth, Croydon, and a small portion of Tooting. The main objects of the Bill were to enable the Company to acquire additional land for the purpose of new works, to convert and consolidate the existing capital, to raise additional capital, to form a renewal fund, to convert the undertaking from a maximum-price to a sliding-scale Company, to secure a reduction of the minimum candle power, and to introduce the modern method of testing. The Company were incorporated by Act of Parliament in 1867, with a maximum price of 5s. 6d. per 1000 cubic feet; the candle power being 14. The whole area of supply amounted to 10,629 acres, and was very scattered in character. Altogether, they reckoned that about one-fourth of the area was either never likely to be built upon at all or to remain unoccupied for many years. The result was that there was a long length of main, which was, in proportion to the amount of gas supplied, more or less unremunerative. Whereas in the adjoining districts of Wandsworth and Putney the Gas Companies supplied a little under 12 million cubic feet to a mile of main, and in Richmond the supply was nearly 8 million feet, the Mitcham and Wimbledon Company were only supplying 3 million feet per mile. The capital was fixed in 1867 at £100,000 of 10 per cent. maximum and £80,000 of 7 per cent. maximum, together with borrowing powers up to £45,000. Under this Act, the promoters had carried on their business to the present day, with the exception that in 1892 a Provisional Order was obtained which had the effect, as was common in those days, of increasing the minimum candle power from 14 to 15, and also prescribed the test which was then in vogue for ascertaining the illuminating power. It had become necessary, in consequence of the increase in the Company's business, to make provision for further lands upon which to erect works for manufacture and storage purposes. Though there were originally two petitions against this, no appearance had been made in support of them; and this portion of the Bill therefore came before the Committee unopposed. Then there was the consolidation of the existing capital, to which objection was raised, though he did not know whether it would be persisted in. What he was asking for had become the common practice of Parliament; and he could not remember a case where, though raised in a petition, this point had been persisted in before the Committee. First of all, they sought to consolidate the capital existing, and to convert it into one class of stock. The result would be that the £100,000 of 10 per cent. would become £200,000 of 5 per cent. stock, and the £80,000 of 7 per cent. would become £112,000 of 5 per cent. stock. Thus the amount of interest payable on the nominal capital would be the same. The sum of £1304 which had been received as premium on the existing capital, would be treated independently, and remain an addition to the total of the new capital. As to the additional money required, the present capital was exhausted, and the business had increased rapidly, and was increasing rapidly. In fact, if they were to ask for the amount of capital necessary to carry the business on for the usual term allowed by Parliament, based upon the existing rate of increase, the present demand would be largely exceeded. The last ten years' increase came out at about 7½ per cent. compound per annum; while that of the last four years was 11 per cent. compound. But last year the increase was no less than 18 per cent. They could not contemplate for a moment that this was likely to go on; and they did not ask for additional capital upon any such assumption. The engineers had fixed the probable increase at something like 8 per cent. compound for the future, and had assumed that the Company would be given at any rate twelve years before coming again to Parliament. This would mean an increased sale of 725 million feet in the interim. Then came the question, How much capital per million feet is fair to take for such a district as this? They were asking by the Bill for £300,000 share capital and £100,000 loan, making £400,000 in all—not sufficient even to go on for twelve years on the basis of an 8 per cent. increase. One of the petitioners said the demand for capital was excessive. With reference to the proposed insurance fund, in recent years Parliament had decided there should be set aside 1 per cent. per annum as an insurance fund; but the whole was not to exceed one-twentieth of the capital. The next point was the change from a maximum-price and maximum-dividend undertaking to a sliding-scale proposition. This change was now generally accepted as a proper one—giving advantage to consumer and company alike. As to the standard price, the Bill originally provided for 3s. 9d.; but he was going to ask for 3s. 6d. per 1000 cubic feet. This was the actual price paid to-day. They also asked that the scale should be the usual one—2s. 6d. for every penny. For each reduction of 1d. on the price now ruling, the shareholders would get £390 and the consumers £1720. Other important points raised were the reduction of the standard power from 15 to 14 candles and the question of testing. As he had already pointed out, the Company's original Act prescribed a minimum of 14 candles; and this was raised by the Provisional Order to 15 candles. But inasmuch as gas had, by reason of the introduction of incandescent burners, become more important for heating and power purposes, the reduction to 14 candles had since been allowed. As to the testing, they were seeking to adopt the most modern and approved ideas. The petitioners, on the other hand, were suggesting the most curious methods of testing. The question of the standard price was to some extent mixed up with that of illuminating power and testing, because it was alleged that if the candle power was reduced from 15 to 14, and the proposed methods of testing were also adopted, the Company would gain through being able to manufacture gas at a less cost. There would be some gain; but if the reduction of candle power and the application of the modern testing permitted of the production of gas at a reduced cost, it could be supplied at a cheaper rate to the consumer, who would accordingly benefit under the sliding-scale. With regard to the petition of the London County Council against the Bill, it was quite true, as alleged, that part of the Company's area lay within the Administrative County of London. This had reference to Tooting, which was only one-tenth of the whole district supplied. From this the London County Council took up the position that the Company ought to become a London Gas Company; and he could not help thinking this was the real object of the petition they had presented.

Mr. *B. R. Green*, the Engineer and Manager of the Company, examined by Mr. NALDRETT, said the total area of supply was 10,629 acres, and the population in 1906 was estimated at 117,790. The houses he put at 25,035; the number of ordinary consumers being 7842, and of slot customers 8889—a total of 16,731. He bore out Counsel's opening statement as to the scattered nature of the district, and reckoned that one-sixth of the total area was unremunerative. It was 6 miles long, and 4·43 miles across at its widest part. The change which had come over the neighbourhood in recent years he regarded as

a great disadvantage to the Company, as it involved a disproportionate outlay on mains; and it was more costly to supply gas to the penny-in-the-slot people than to ordinary customers. Of the total amount of gas now consumed, 65 per cent. was for lighting and 35 per cent. for heating, cooking, and other purposes. The Company had overspent their capital by about £9000. The maximum price of gas was fixed in 1867 at 5s. 6d. per 1000 cubic feet. The gas sold in 1897 was 214,875,400 cubic feet; and this had grown in 1906 to 414,453,000 feet—an increase of 92 per cent. In 1897, the average per consumer was 59,761 cubic feet; but this had fallen in 1906 to 24,771 feet. In 1897, the main mileage was 70; and this had grown in 1906 to 126. The Company had to incur relatively larger expenses in order to supply gas to the new people. He expected the future increase in consumption to be about 10 per cent.; and there would have to be a further expenditure of capital to keep pace with the requirements of the additional business. With regard to the illuminating power, it was the usual thing to bring down the standard to 14 candles; and the mode of testing suggested by the Bill was more reasonable than the one they desired to discard.

Cross-examined by Mr. FITZGERALD, witness said that one of the objects in asking Parliament to alter the Company from a maximum-dividend to a sliding-scale one was to let the shareholders have a still higher dividend; and he hoped that, if they got the standard price of 3s. 6d. per 1000 feet, they would do so. The Company were asking for a lower illuminating power, so that they could manufacture at a cheaper rate. He was quite aware that gas of a lower candle power had been produced by other companies; but he was unable to say whether the standard price was also reduced in those cases in the interests of the consumer. He did not know that the permission of Parliament had in every instance been given to the reduction of candle power on the understanding that the standard price should also be lowered. He admitted that if the Company were allowed to supply 14-candle gas instead of 15-candle, the consumer ought to get some benefit. It was not a fact that by testing their gas with the burner known as the "Metropolitan" the Company secured the benefit of 1½ candles.

Mr. FITZGERALD: What benefit does it give you? You have now to supply 15-candle gas. If you change the burner, as you propose to do, 13½-candle gas would do for that in the test, and would produce what you call 15-candle gas?

Witness: No.

What do you say it would make?—It would not give a correct record of the illuminating power.

If, instead of producing 15-candle gas, you made 14-candle, you would be liable to a penalty. Do you deny that the change of the burner has the effect I am putting to you—that the lower illuminating power shows the same number of candles?—I do not think it is a lower illuminating power. The new burner gives a correct record of the illuminating power; the old one does not. It is quite true the new burner brings out the illuminating power to a greater extent; whereas the old burner does not give the correct illuminating power.

Cross-examination continued: The object of the standard price was to enable the Company, if they conducted their business well, to pay the standard dividend. They had in the last year been charging for repairs an amount above the average—over 15d. per 1000 cubic feet. He did not think that, taking one year with another, 7d. per 1000 feet ought to be sufficient in the case of his Company; he should put it at nearer 12d. He did not know of any other Suburban Company charging 12d. for repairs; but no other undertaking was working under the same conditions. The chief cause for their high figure was the low consumption of gas per mile of main. As to capital expenditure, they were contemplating the purchase of a new site and the erection of works upon it; and there would be coal-stores built as required. The site, in round figures, would cost £3000, and the coal-stores about £2000. With regard to the retort-houses, he could not say exactly what was wanted. They were reconstructing them at a cost of about £10,000; and when completed, their capacity would not be very much above the demand to be placed upon them. With the water-gas plant they would have a manufacturing capacity of 2,700,000 cubic feet per day; while the maximum output at present was over 2,000,000 feet.

Mr. FITZGERALD: With a surplus capacity of 700,000 cubic feet, it does not look as though you wanted to spend much money on new retorts?

Witness: We require a reserve.

But you have got it already in this 700,000 cubic feet surplus. You say you do not know when you will have to spend this money, because you do not know your increase in consumption?—That is so.

And yet, in support of the application for capital, you say you do know the rate of increase, and put it at 10 per cent?—Yes.

Cross-examined by Mr. G. J. TALBOT, witness said that in 1900, when coal was dear, the price of gas was raised by the Company from 3s. 8d. to 4s. 3d. per 1000 feet; and in the following year the balance available for dividend was increased, so that all the loss owing to the high price of coal was put upon the consumer. They preferred to raise the price of gas by 7d., rather than take money out of the reserve fund, which was—Counsel maintained—intended to protect the consumer against a sudden rise in the price of coal.

Mr. *H. E. Jones*, examined by Mr. HONORATUS LLOYD, said it was absolutely necessary that the Company should have additional capital. The district was an aggregation of villages, with a straggling area in between; and there was necessarily a large portion of unremunerative mains. For the last few years, the Company had been supplying the demand which had arisen from the poorer class of people. The penny-in-the-slot system was likely to be very largely increased in the future. The capital asked for in the Bill was a reasonable sum, unless the Committee wanted to run the Company into expensive parliamentary applications every few years. In twelve years, they would need to spend £700,000 upon new works. In that period the sale would be increased by 725 million cubic feet; and if they were to meet this demand alone £575,500 would have to be spent, which was £175,000 more than the Bill asked for. His calculation was based upon the assumption that they would not have to spend more capital in the future than in the past. Under the sliding-scale, it was no advantage whatever to the Company to increase their capital. The standard price was, of course, the *crux* of the Bill. The Company were separated from the Thames, which the coal came up, and so had to pay extra charges in consequence. Then there was the additional main expense that all other companies did not incur, and which accounted for an additional 2d. per 1000 feet in the price of the gas. There was also the question of rates. They paid nearly 1½d. per 1000 feet more for rates than the Wandsworth Company. Then there was the higher rate of dividend upon the original capital, which was apt to act unfairly. So that, altogether, he should put it that the Company's expenses were quite 9d. per 1000 feet more than those at Wandsworth. At the present time a considerable margin had to be allowed in the cost of raw material. Something approaching the figure named in the Bill would be a fair standard price. The Company were quitting a very large security in their present maximum price. The shareholders were very safe when there was such a margin as they had. The reduction of the illuminating power was a very small thing. It had been well argued by Sir George Livesey that the difference between 14 and 15 candle power was not very much more than ½d. per 1000 cubic feet. The average price of all the companies in the suburbs, large and small, including this Company, was, according to the latest published figures, 2s. 8½d. per 1000 feet. The Company should certainly make provision for the future by securing additional land for further works. The proposed site was suitably situated near the railway, and was not in a neighbourhood where property would be injured. The reduction of candle power was a just and proper thing. He did not for a moment agree with the suggestion that a flat-flame burner should be used for the official test instead of the argand burner. In his opinion, there was no reason for applying to this Company the provisions that were applicable to a London undertaking.

Cross-examined by Mr. FITZGERALD: In London the test could be made at any time in the day, but outside they could only test within specified hours; so that if the Metropolitan testing clause was in the Act, and the test was carried out at five minutes past nine, it would be impossible to carry out the other two necessary tests to complete the operation. There had to be an hour between each of the three tests in London. As to the change of burner, this would not necessarily be to the advantage of the Company. The burner proposed was the one adopted by the Board of Trade. In Wandsworth they kept the old burner, and were still using it; and it gave the same results as the "Metropolitan" burner. The conversion of the capital was to the advantage of consumers, because it would be all on a 5 per cent. basis; and a 5 per cent. stock at auction would secure better results than half the amount of 10 per cent. capital. In face of all the charges in the suburbs, he did not think that 3s. 6d. would be too much for the standard price.

Sir FREDERICK BANBURY: I have a suggestion to make. We shall not meet again until Monday; and if in the meantime an agreement as to the standard price and as to the test can be arrived at, it may facilitate matters.

Monday, March 18.

Mr. BALFOUR BROWNE said the adjournment had led to negotiations taking place. His clients were willing to concede some things; and, owing to the pressure that had been put upon them, they had conceded others. Finally, they had agreed upon the following terms of settlement with the Local Authorities:—

1.—Standard price to be 3s. 2d. per 1000 cubic feet.

2.—Additional capital to be £240,000, with the usual borrowing powers of £80,000; also power to borrow a further sum of £15,000 in respect of the old capital.

3.—The Company, within one year from the passing of the Act, to provide a testing-station with a building and the necessary apparatus, and to maintain the same on a site to be provided by the Company at or near Haydon Road, in the borough of Wimbledon.

4.—Clause 30 ["Testing for Quality"], omit sub-clauses 4 and 5, and reference to table photometer. The Local Authority to have the right, jointly with the Company, to apply to the Board of Trade for the approval of the use of any other burner, photometer, or standard light.

5.—Clause 34 of the Wandsworth and Putney Gas Act, 1900, to be inserted in the Bill in regard to the laying of mains in private streets not less then 2 feet below the surface.

6.—The amount of undivided profit which the Company may carry forward in any half year to be limited to the amount required to pay half-a-year's dividend at the authorized rate on the paid-up capital of the Company for the time being.

7.—Clause 24 ["Charge for Gas Supplied by Means of Prepayment Meters"] from the Model Bill to be inserted.

8.—Clause 2, the proviso on p. 62 of the Model Bill, lines 13 to 16 inclusive, to be added.

9.—Clause 5, as to testing for calorific power, sulphur impurities, and illuminating power with flat-flame and incandescent burners, of the South Suburban Gas Act, 1906, to be inserted in the Bill, omitting (II.) and (IV.) of the section.

10.—All future mains laid by the Company in any street to be at a depth of not less than 2 feet, unless the consent of the Local Authority is obtained.

11.—A sub-paragraph similar to sub-section 2 of section 18 of the Merthyr Tydfil Gas Act, 1906, to be added to clauses 10 and 11 of the Bill, with the substitution of the sum of £180,000 for the sum of £33,300 referred to in the Merthyr Tydfil Act.

The CHAIRMAN: What is the point of the last clause?

Mr. BALFOUR BROWNE: You know that in this Act we are converting our capital and doubling it; and the petitioners say that the insurance fund and the renewal fund should be calculated upon the actual and not on the double amount. That satisfies all the Local Authorities on this Bill.

Mr. FITZGERALD: I think all the Local Authorities are agreed that a satisfactory settlement has been reached; and we ought to express our acknowledgments to the Committee for having suggested a conference on Friday.

Mr. ELDRIDGE remarked that no settlement had been come to with him.

Mr. BALFOUR BROWNE said he would call a witness upon this sole remaining point. A letter had been sent from the petitioner's Solicitors asking compensation for damage done to his property. The petitioner

was Mr. George Pitt, the gentleman who did not appear at the right time.

Mr. *E. Herbert Stevenson*, examined by Mr. BALFOUR BROWNE, gave evidence to the effect that the erection of the proposed gas-works would not have any bad effect upon the value of Mr. Pitt's house property. There was a road in between, and the works would be placed upon a site which was at present an abandoned gravel pit. It could only be used for the erection of some such works as gas-works. In the Century Road, the Company might be prevented from building works within 40 or 50 feet. If this were done, no harm would ensue to Mr. Pitt's adjacent property. The inhabitants of the houses, which were rented at £20 per annum, were nearly all working men; and if the tenants did not like the smell of the gas-works, the men employed on the works would only be too glad to rent them.

Mr. BALFOUR BROWNE: My learned friend wants compensation for possible injury. What do you say as to that?

Witness: I must say there is bound to be smell and smoke from gas-works, but not necessarily sufficient to create a legal nuisance. I do not know of any case, however, where a compensation clause has been inserted in a Bill.

Mr. ELDRIDGE (to witness): I do not know whether you have seen the clause we wish to have inserted?

Witness: Yes; I have read it. It is taken from a Water-Works Act, where it was intended to cover any damage caused by construction operations. As a general rule, gas-works would not damage this class of property.

Then why do you suggest that they should not come within 40 or 50 feet?—It is always better so; and in this particular case the proper place of the manufacturing works is on the lower part of the ground, and the storage premises and workshops would be very much better placed on the other side of the road.

If you are not going to do any damage to our property, why not use any part of the land for the manufacture?—Because there would be a certain amount of smell and smoke, which would not necessarily amount to a legal nuisance. It would not be difficult to get damages in an action.

It would be a difficult matter, in these ordinary cases of smoke and smell, to bring an action?—Yes, if the works were being carried on in the best possible way. So long as there is not more smell and smoke than necessary, I do not think a legal nuisance would arise.

Is your point that the gas-works would not injure this property?—Yes.

Then why do you object to the clause?—I do not like to see the general law altered in special cases without special reasons.

But if your contention is true, the clause could do you no harm?—It might put us to expense in regard to arbitration matters.

But if you are not going to injure our property, why not consent to the clause?—If we are not going to injure your property, I cannot see why you should have the clause. It is altering the general law simply for one case; and there is no possibility of its coming into operation.

The CHAIRMAN (to witness): Does all the property in Century Road belong to Mr. Pitt?

Witness: Yes; he has Century Road and Belgrave Park—22 houses in all.

Mr. ELDRIDGE, addressing the Committee, said he was somewhat surprised at the illogical position taken up by the promoters. If, as was affirmed, no injury would be done to his client, there was no reason why he should not have the clause suggested. The Company professed to be acting in some way in the interests of the public by resisting the insertion of the clause; and yet they admitted that there must be some smell or smoke, though it would not be sufficient to enable his client to bring an action. However much it might suit the Company to depreciate his client's property in Fieldgate Lane, he had had to sell the property at a considerable loss after they had extended their operations in his neighbourhood; and now the Company were going to build works near his remaining property, which must be attended with considerable nuisance and subsequent damage. Counsel submitted that one of two things should be done—either the Bill should be thrown out, or his client should be protected. If the Company were right in saying there would be no damage, there was no reason why the clause should not be inserted in the Bill.

The CHAIRMAN asked Counsel to read the clause.

Mr. ELDRIDGE read the clause as follows:—

> The undertakers shall make full compensation for all damage sustained by George Pitt, his heirs and assigns, in respect of twenty-two houses owned by him in Century Road and Belgrave Park by reason of the exercise of the powers vested in the undertakers by this Act or any Act incorporated therewith—such compensation, in case of difference, to be determined by arbitration, in manner provided by the Arbitration Act, 1889.

The CHAIRMAN: Is there any precedent for such a clause being inserted in a Bill?

Mr. ELDRIDGE: I cannot say that there is; but, if I have made a case out, I think one ought to be created.

Mr. *Davey*, a valuer, examined by Mr. ELDRIDGE, said he estimated the value of Mr. Pitt's houses in the neighbourhood of the Company's proposed works at £5030. They were all occupied, and produced a rental of £460 per annum. He was of opinion that when the proposed works were built their value would depreciate by £1000.

In cross-examination by Mr. BALFOUR BROWNE, witness said he thought the houses would not be convenient for the men employed in the gas-works. The better class of houses were let at 10s. 6d. per week, and others for 7s. and 8s. per week.

Re-examined by Mr. ELDRIDGE, witness said it did not at all follow that the men employed in the gas-works would like to live close to their business; they might wish to get as far away from it as possible.

Mr. *George Pitt*, the owner of the property in question, said it was very well let to first-class tenants. It was worth £5000, and would be depreciated by 20 per cent. by the projected works. His former property in Fieldgate Lane suffered depreciation from a similar cause.

Mr. BALFOUR BROWNE: You value the houses at £5000. Did they cost about £3000?

Witness: They cost more than £4000.

If any other works, emitting smell and that sort of thing, were erected on this site, would damage to your property be sustained?—Varnish works would injure the houses; but the varnish works now in existence near my property are three times further away than the proposed gas-works will be.

Mrs. *Powell*, examined by Mr. ELDRIDGE, said she collected the rents at Fieldgate Lane; and the tenants complained of the bad smells from the gas-works. They complained of feeling ill, and of the films upon their windows. They said they had to keep the windows shut.

By Mr. FIENNES: The houses changed tenants very often.

This concluded the evidence in support of Mr. Pitt's petition.

Mr. BALFOUR BROWNE asked the Committee not to insert the clause. He said that apparently there had been no real depreciation of the property.

The CHAIRMAN: I do not think I need trouble you to leave the room, as we are of one mind upon this question. The Committee are unanimously of the opinion that they cannot alter the general law of the land by inserting this clause. I think the suggestion made, that the manufacturing building should not be put within 40 feet of the road, might be carried out. Subject to this condition, the preamble of the Bill is proved.

UNOPPOSED BILLS.

The Committee of the House of Commons on Unopposed Bills presided over by Mr. ALFRED EMMOTT (the Chairman of Committees) had before them on Thursday the following Bills.

Gas Companies (Removal of Sulphur Restrictions) Bill.

Mr. COOPER (Parliamentary Agent) said this was a Bill for relieving certain Gas Companies of liability for forfeiture or penalty for sulphur compounds other than sulphuretted hydrogen. The Bill followed exactly the precedent of last session, which relieved some 14 Gas Companies; and it was now proposed to relieve the following Companies of penalties: The Bath Gaslight and Coke Company, the Blyth and Cowpen Gas Company, the Eastbourne Gas Company, the Scarborough Gas Company, the Tynemouth Gas Company, the West Ham Gas Company, and the Weymouth Consumers' Gas Company. Representatives of these Companies having been called and proved that the statements in the preamble were true, the Bill was passed.

Llandrindod Wells Gas Bill.

Mr. LEES (Messrs. Lees and Butterworth) said this was a Bill to incorporate a Company and authorize it to supply gas at Llandrindod Wells and three adjoining parishes. For ten years Llandrindod had been lit by the electric light; and this would be the first introduction of gas. This was an agreed Bill. By the Electric Lighting Act of 1896, the Llandrindod Council were prohibited for 42 years from undertaking a supply of gas in the district. Therefore the only way in which a supply of gas could be given was by the introduction of the Electric Light Company. The Company had agreed to purchase a site for gas-works, and had entered into a provisional contract with the owner of the land. The district had practically doubled in population, and had become more and more a fashionable health resort on account of its mineral springs. Last year the resident population was 2500. There were 460 houses; and the rateable value was nearly £16,000—the assessable value being £12,000. The maximum price of the gas would be 4s. 6d. per 1000 cubic feet. The original Bill of last year fixed the price at 5s.; but this was subsequently reduced to 4s. 6d. The Corporation proposed to oppose the Bill; but at a meeting of the ratepayers it was resolved that the Council should not do so. There was no sliding-scale.

Mr. *Charles Hunt* was called, and stated that the maximum price was a low one considering what they had to pay for materials. Asked if the charge of 10d. for the hire of prepayment meter and fittings, and 6d. for the meter without the fittings, was a fair one, he said 6d. would be 10 per cent. on the cost; but it was the essence of the prepayment system that the price should be put upon the gas.

Mr. CALDWELL: What is the ordinary consumption of gas?

Mr. LEES: About 10,000 cubic feet per annum. There were two new clauses (1) making the maximum charge for hire of any meter other than a prepayment meter at the rate of 15 per cent. per annum on the cost of the meter; and (2) for the Company not at any time to supply gas containing carburetted water gas or Dowson gas without the consent of the Llandrindod Council. Then the illuminating power had not been reduced from 14 to 13 candle power as had been the case during the last two or three years.

Sir CHANDOS LEIGH: Assuming you fall to 13½ candles, there is no penalty, but if you fall to 13 there is a five pounds' penalty.

Mr. LEES: Yes.

Mr. EMMOTT: Has any clause of this kind been given before?

Mr. LEES: It was given to the South Suburban Company.

Mr. CALDWELL: But there is no limit here as to the time the illuminating power may be reduced.

Mr. LEES: But the penalty is on every test.

Mr. CALDWELL: It is not to be at a lower illuminating power for a whole year then?

Mr. LEES: No. Then, with regard to supplying gas in bulk, in accordance with the clause in the Model Bill, if we supply in bulk outside the district we must get the consent of the company or the local authority who may be authorized to supply gas. But assuming there is a company authorized to supply gas in this rural district, if we get the consent of the company, then we say we have done all that is necessary, because the Rural District Council have no power to supply gas, and they might act as a dog in the manger to stop a supply being given.

Mr. CALDWELL: But the Local Authority have an interest in seeing that outside people do not come in with gas to prejudice their right.

Mr. LEES: But round here it is a rural district, and they have no right to supply gas.

Mr. CALDWELL: They have it in other Acts.

Mr. LEES: That may be so if the district is an urban district outside, because under the Public Health Act, an urban authority has

certain power to supply gas; but a rural district has no power. This is a rural district; and if you put it in the power of the Rural District Council, you may prevent us getting gas altogether. We follow the Model Bill.

Mr. EMMOTT: I understand the clause in the Model Bill was changed quite recently. Can the Local Government Board take into account the alteration of the Model Clause?

Mr. BOYCE (Local Government Board): I do not at all think that the alteration of the Model Clause applies to this case, because this is a rural authority, and they have no power to become a gas authority. The reason of the alteration of the Model Clause was this, that by requiring the assent of the outside local authority who were not themselves supplying gas, that consent might have been refused merely on the ground that the outside local authority were an electric supply authority, and therefore would not give consent that would damage their own electric supply. This was considered by Lord Onslow and Mr. Gray to be a case which was rather hard on the gas companies; and the alteration in the Model Clause was accordingly made.

Sir CHANDOS LEIGH: What do you say to this on the merits?

Mr. BOYCE: I prefer the Committee to decide that the Rural District Council cannot be a gas authority; and in this case it is only supplying gas in bulk. I am not arguing against our report, because we do not quite agree with the amendment of the Model Bill, and we think in the case of the urban authority the old clause is better. But in each case the Local Government Board desire to leave it to the Committee to consider the *pros* and *cons;* and you will not get the *pros* and *cons* unless you report in favour of the old Model Clause.

Mr. EMMOTT: Then the penalty clause is struck out; and the supply in bulk is left in on the merits of this particular case.

The preamble was passed accordingly.

Basingstoke Gas Bill.

Sir CHANDOS LEIGH said that the promoters were incorporated into a Company in 1887, and had never been to Parliament for powers since. This was an unusual conversion of 10 per cent. into a uniform price; and the Company wanted £30,000 additional capital. The reason for this would have to be explained by the Company's Engineer.

Mr. *William Higgs*, the Engineer of the Company, gave particulars of the capital required. The existing capital was £31,600 in all; £11,100 at 10 per cent., £5500 at 5 per cent., and £15,000 additional capital granted by the Act of 1887 at 7 per cent. The whole of the capital authorized in 1887 had been expended in consequence of the increased population and the greater demand for gas in the district. This additional capital would last about 14 years. The present population was 10,000; in 1887 it was 8800.

Sir CHANDOS LEIGH: When the Company obtained their powers in 1887, the quality of the gas was fixed at 14 candles; but five or six years ago it was reduced, owing to the incandescent light. In consideration of this reduction in quality, the Local Authority got the Company to reduce their price when they reduced the standard. Here the hire for prepayment meters with fittings is 10d. per 1000 cubic feet, and 6d. without fittings. Is that fair?

Mr. *Higgs:* I have heard the evidence of Mr. Hunt in the previous case; and I agree with him that it is 10 per cent. on the cost, which is equivalent to the 6d. The Local Authority have no power to supply gas; but they had a Provisional Order to supply electricity.

Mr. TORR: This relates to outside the limits of supply.

The preamble of the Bill was then passed.

Bude Gas Bill.

Mr. BAKER said this was a Bill to supply gas to the Urban District Authority and the rural district in the immediate vicinity.

Sir CHANDOS LEIGH: Is there a Local Authority outside the limits, or is it a Rural Authority outside?

Mr. BAKER: It is a Rural Authority, and is on the same footing as in the Llandrindod case.

Mr. *E. Herbert Stevenson* said he explained the Bill to the Bude Council, who agreed to the terms. The promoters asked for 5s. per 1000 cubic feet and 14-candle power. The price was reduced to 4s.; and there was a reduction of 20 per cent. on the public lighting. They had a sliding-scale with the 4s. price. The capital had been reduced to £8000.

Sir CHANDOS LEIGH: You have power to borrow. This is rather absurd considering the small amount of capital. Then, as to the testing-clauses, we have not yet finally settled.

Mr. *Stevenson:* The testing-clauses are not yet finally settled for any gas company.

The preamble of the Bill was passed.

Falmouth Gas Bill.

Mr. BAKER said this was a settled Bill with the Falmouth Corporation.

Sir CHANDOS LEIGH: I see some question arises about contracting in bulk.

Mr. BAKER: Yes. It goes about 2 miles outside of Falmouth into a rural district. We have no objection to the Basingstoke clause.

Mr. CHANDOS LEIGH: The present capital is £18,500, and you want £15,000 additional capital. How long will the £15,000 last you?

Major *Mead* (Chairman of the Company): About 15 or 16 years.

Mr. BAKER: The Truro Gas Company, who supply a similar district, have obtained powers for £60,000; and they have a standard price of 4s. 2d. per 1000 cubic feet, against our 4s.

The Bill was passed.

Water Purchase Question at Slough.—The Slough Urban District Council have appointed themselves a Committee to inquire into the advisability or otherwise of taking proceedings with a view to the purchase of the undertaking of the Slough Water Company. When the matter was being discussed, one member remarked that when the Council went into the subject ten years ago they were staggered at the figure asked; and he expected they would be even more staggered now. It was, however, pointed out that the present motion was only a preliminary step.

ANNFIELD PLAIN AND DISTRICT GAS BILL.

House of Commons Committee.—Tuesday, March 12.

(*Before Sir* FREDERICK BANBURY, *Chairman, Mr.* FIENNES, *Mr.* RAPHAEL, *and Mr.* MOND.)

This Bill is to incorporate a Company with power to acquire and construct gas-works, and to manufacture and supply gas in the urban districts of Annfield Plain and Tanfield and the parish of Medomsley, in the county of Durham. It was opposed by the Annfield Plain Urban District Council.

Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C., appeared for the promoters; the Hon. J. D. FITZGERALD, K.C., and Mr. R. I. SIMEY represented the District Council.

Mr. HONORATUS LLOYD, in opening the case, explained the object of the Bill, and stated that the three townships of Annfield Plain contained a total population of 26,000. Since 1870 there had been two distinct supplies of gas—one being obtained from West Kyo and the other from Dipton. The gas-works at Kyo were owned by a limited Company, and the Dipton business was in the hands of private individuals. These parties did not possess statutory powers to supply gas—that was to say, they had pipes laid down, but had no right to open the streets, nor were they under any obligations to supply gas of any particular quality or at any fixed pressure. Generally speaking, the supply had been very unsatisfactory. In the autumn of last year, Messrs. Schultz and Comins purchased these two undertakings; paying for them in cash a sum of £10,000. They had subsequently set to work to improve the supply—laying down larger mains for the purpose. The Urban District Council having refused them permission to put down any more mains, the promoters of the Bill before the Committee asked for power to acquire these gas undertakings, and supply the district with gas under statutory authority. If the Bill were passed, the works would be taken over at a price to be settled by arbitration. It was proposed that the share capital should be £45,000. This, together with borrowing powers up to one-third of the original capital, was, he considered, a fair sum to allow the promoters to carry on business for fifteen years without having to come again to Parliament. With regard to the charge for gas, it was thought that 4s. 6d. per 1000 cubic feet would be a fair maximum price; but it would be the promoters' business to supply at a lower figure if possible. The present price was 4s. in one case, and 4s. 6d. in the other. So far as the maximum dividend was concerned, inasmuch as the Company would be working for the first time under statutory powers, they should have asked for a certain proportion, as original capital, to bear interest at 10 per cent., and the balance at 7 per cent. with the auction clauses applicable thereto; but he was prepared to accept 7 per cent. on the whole of the capital.

Mr. *W. A. Schultz*, the senior partner in the firm of Messrs. Schultz, Comins, and Co., accountants, said that, in conjunction with his partner, he purchased the gas-works at Dipton—taking them over as from March 1, 1906. The actual price paid was £2161 12s., and the amount paid for the West Kyo works was £7000.

In cross-examination by Mr. FITZGERALD, witness said the district which they proposed to serve with gas was inhabited principally by colliers and shopkeepers who ministered to their necessities. Before he purchased the works at Dipton, he had had no connection at all with the place, nor had any of the gentlemen named as promoters of the Bill. He received particulars that the works were for sale in February or March, 1906.

Mr. FITZGERALD: By the contract which you ultimately made, these works appear to have been sold on Feb. 20, 1906, to Messrs. Best and Turner, of Bradford, for £1650?

Witness: The purchase had not been completed.

Then you appear on the scene, and purchase their agreement from Messrs. Best and Turner?—Yes.

What was the share capital of the Annfield Plain Company?—You may take it I have no knowledge.

Don't you know? Was the whole share capital of this Company £2000 paid up?—We bought the works, not the capital. The Company had spent on their works a considerable sum out of revenue, which is a very important point.

In answer to further questions, witness said possibly the Company, on their £2000 capital, had been paying 5 per cent. for a number of years—up to the time they sold the works, and the last three years had been making a profit of 7 per cent. The works were not up to date; and it was proposed to discontinue them later, but not because they could not be used. Counsel put it to witness that the works were old, starved, and neglected, and that the Company had no business to pay any dividend at all; but he declined to admit that. He only said the works were not kept up to date.

Mr. *E. H. Stevenson* said he had inspected the district and works at Annfield; and it appeared to him that there was a very considerable demand for gas in the neighbourhood. In the two works there were in all 31 retorts, which could supply about 26 or 27 million cubic feet of gas a year. The rest of the plant was not equal to the retorts, and would have to be enlarged as the consumption of gas increased. Before the works were acquired by the promoters, everything was apparently done to restrict the growth of consumption; and great difficulty had been experienced during the past winter in keeping up the supply. In more than one case, gas had gone out in the Dipton district. This had been consequent on altering or resetting the retorts. The condenser was capable of dealing with more gas than was likely to be made for some time to come. There were in the Annfield district about 8000 yards of mains, ranging from 5 to 3 inches in diameter. In the Kyo district there were about 5000 yards of mains. When the concern was bought, they ranged from 4 inches down to 2 inches in diameter. They had lately been added to by the laying of a 6-inch main connecting up the two gas-works. The Dipton works were now in good order, and fairly equal to the present demand upon them. It would be greatly to the advantage of the district that the works should be carried on together or be amalgamated; and still more that those who held them should be under parliamentary regulations, so that the consumer could get a supply of gas constant both in purity and in

pressure. Asked what he had to say as to the capital powers proposed in the Bill, witness said the present case was one of the most difficult he had ever had with regard to calculating the capital. It was equal, in fact, to starting a new undertaking. There was a small quantity of gas now sold—about 9 million cubic feet per annum; but there was such a large field for its supply that he thought in a few years the demand would require works to furnish approximately 40 million cubic feet. Then capital was required for the development of the undertaking for another eight or ten years. In his opinion, therefore, the amount asked for by the promoters was not excessive. He had made a rough estimate as to what must have been the expenditure of capital on the present works; and in his opinion some £12,000 or upwards had been spent on the two undertakings prior to their acquisition by Mr. Schultz and his partner. There had already been a considerable increase in the demand for gas since the undertakings had been overhauled; in fact, people could not be connected up fast enough. The works were not able to supply the demand. If the Local Authority had not refused permission, a considerable number of additional mains would have been laid by now.

Mr. VESEY KNOX: It has been suggested that this undertaking would be very much over-capitalized if the amount of money were expended which is proposed by the Bill. Have you worked it out?

Witness: The area is somewhat scattered, and the cost of the mains would be more than usually heavy. Moreover, a number of houses would have to be furnished with pipes and fittings, as the people are not of the class who could put in their own fittings. In fifteen years, I think, there would probably be an expenditure of about £700 or £800 per million cubic feet of gas sold.

What do you say as to the price proposed to be charged for the gas?—It is always best to have a standard price. It is certainly best for the consumer, because it induces a company to supply gas of the best quality. I think the maximum provided for in the Bill is reasonable. The lowest price now being charged in the district is 4s. per 1000 cubic feet. It is the invariable practice of Parliament, in the case of a maximum-price company, to allow some margin between that price and the one charged; and 6d. is not too much. Of course, the Company will not be likely to charge 4s. 6d. if they can help it, but will reduce the price as much as possible, in order to increase the number of consumers.

The petition against the Bill urges that the supply of gas could be more economically carried out by the District Council?—But the Council are not taking any steps to do it; and I do not see how they could supply more economically.

In cross-examination by Mr. FITZGERALD, witness, in explanation of the suggested substitution of £5 for £20 as the penalty for not keeping the gas up to standard, said that what was right for London in the matter of relief was certainly right for any and every other company in England. Counsel pointed out that, under the Gas-Works Clauses Act, 1871, companies were liable to a penalty not exceeding £20 every time the gas was below the illuminating power mentioned in the Act, and that in the present case, the promoters having undertaken to supply gas of 14-candle power, the Magistrate's discretion as to the imposition of a fine would be limited to £5. Witness acquiesced. In answer to further questions, he said he expected the sale of gas to reach 40 million cubic feet in four or five years, though the present consumption was only 9 millions. What it might become in twelve years' time must, of course, depend upon the growth of the neighbourhood.

In answer to a question by a member of the Committee, witness explained that the law provided for an extra charge of 10d. per 1000 cubic feet in the case of slot-meter consumers.

Mr. *W. C. Parkinson*, a Director of Messrs. Parkinson and W. & B. Cowan, Limited, said he was associated with Mr. Walker, Mr. Hazell (ex-M.P. for Leicester), and others in the promotion of the Bill. He was largely interested in various gas undertakings, and had agreed to invest upwards of £2000 in the present enterprise if everything went through satisfactorily.

Mr. *H. E. Jones* said he had made himself acquainted with the two gas-works under consideration, and had calculated that they had cost £9000 to construct, or £1000 per million cubic feet of gas supplied. He had priced this out on terms which he considered low. No gas engineer of any standing would be prepared to say that he could construct two works on this scale for less than £10,000. Then there would be the floating capital to work the concern, the money in the bank, book debts, and so on. It had always been the practice to allow a special advantage to original capital.

Mr. VESEY KNOX: There is one thing you consider to be an adverse circumstance—that is, the leakage?

Witness: Yes. In a colliery district the leakage amounts to 40 per cent., which means that in the price of gas you must make a large allowance for keeping the mains in order.

You estimate that there will be a very considerable extension of the business when the Company is put on a statutory basis?—Yes. The capital asked for, in my view, is reasonable. The condition in which these people found the undertakings was one of abject neglect and depreciation.

Mr. *Head*, who has charge of the gas department of the North-Eastern Railway Company in the Annfield district, said he thought the proposed change would be in the interests of his Company, who were the largest consumers in the Annfield district.

Evidence was then given in support of the Bill by the Vicar of Dipton and two other local residents.

Wednesday, March 13.

On the resumption of the inquiry this morning, the case for the opponents of the Bill was taken.

Mr. FITZGERALD pointed out the difference between the position of a statutory gas company and that of a limited liability company established under the Companies Acts in the ordinary way. He said that, in dealing with a limited company, the only persons to be considered were the promoters and the shareholders; but in the case of a gas company, Parliament was asked to set up what was, for all practical purposes, a monopoly of gas lighting within the district, and therefore the consumers had to be considered. Parliament had always guarded their interests, and would not allow a company to be set up with extravagant capital and extravagant prices which would place them under the obligation of either paying too much for their gas or going without it altogether. The original Bill disregarded every safeguard Parliament had set up. It was the promoters' original intention to get the Bill through without any of the protection to the gas consumer which had been provided during the past thirty years.

The CHAIRMAN: What we have to consider is what is before us, and not what the promoters may have intended.

Mr. FITZGERALD said he had had thirty years' experience of gas company legislation, and had never seen a Bill which so completely contravened the practice of Parliament as this one did. Who were the Company? Was there any guarantee that when the Company was incorporated there would be anyone in it except Messrs. Schultz and Comins? As for Mr. Parkinson, he did not suppose that gentleman had ever heard of Annfield Plain before. As a gas-meter manufacturer, however, his position was perfectly obvious and legitimate. He (Counsel) did not know of any case where the promoters' profits—mere paper profits—had been allowed by Parliament as was now proposed. This transaction was not a straightforward one. No one knew what the promoters were to be authorized to get. Mr. Schultz did not make it clear that he would not ask for a profit of 100 per cent. He wanted Parliament to pass a Bill which would enable him to go before an arbitrator, with no one present to protect the public, and ask for a very large profit.

The CHAIRMAN: Can you tell us whether an arbitration clause of this kind has ever been inserted in a Gas Bill?

Mr. FITZGERALD: I have never seen a clause of this kind, by which the promoters were to get indefinite profit for the promotion; and I doubt if any such provision was ever passed by Parliament. If there ever was a case in which Parliament ought to see that consumers of gas were protected, it was this. The total capital the promoters are asking for, including borrowing powers, is £60,000. This is an extravagant amount, and would last them I do not know how many years, and keep them away from Parliament. One-half of the capital would be quite sufficient to enable them to raise their output from 9 million to 30 million cubic feet. I cannot help saying that, while over a long experience I know the gas industry to be mainly managed by gentlemen of high repute, who deal equitably with the consumers, and do not endeavour to secure extravagant profits, a Bill of this sort, promoted in this way, casts discredit on the whole gas industry.

The CHAIRMAN asked if Counsel for the promoters was going to produce evidence to show that an arbitration clause such as the one in question had ever been inserted before.

Mr. LLOYD said he was not. He could not remember a case.

The room was then cleared. On the re-admission of the public,

The CHAIRMAN announced that the Committee had carefully considered the objections which had been raised to clause 29, and had come to the conclusion that they should require an amendment to be brought up which would give the Local Authority some power to be present at the arbitration.

Mr. LLOYD: I shall be prepared to give them full access to our books, and provide them with every facility.

Evidence was then given on behalf of the opponents.

Mr. *Corbet Woodall*, examined by Mr. SIMEY, said he had read the Bill before the Committee, and had visited the Annfield Plain district. As to the promoters' suggestion to have a main (practically a dead one) going from Dipton to Tantobie, it was quite contrary to the practice of Parliament to allow competition in gas supply; and, therefore, he should be surprised if the Legislature gave its sanction to the Company entering Tantobie. Lord Joicey was now supplying that area.

Mr. SIMEY: What are the points, generally speaking, which struck you as particularly objectionable in the Bill originally deposited?

Witness: For one thing, the claim that the whole capital should be treated as original is absurd as applied to capital which is not even issued. I also object to the claim for a 10 per cent. dividend; and I have very strong feelings against the proposal that there should be arbitration in a case where the purchase has been settled beforehand. If these promoters are proceeding, as adventurers, to get what they can out of this thing, one can understand it; but they should keep away from Parliament. To ask Parliament to treat their money as original capital is an outrage. I say the standard rate of dividend should be 5 per cent., and the price of gas 4s. per 1000 cubic feet. That is about the price now; and at this figure I think 5 per cent. would be easily earned. Lord Joicey is charging 3s. 7d. and 4s. in Tantobie.

What objections have you to the Bill as it now stands?—I think the capitalization is far too high. It would be amply sufficient if capital were provided to treble the output of the undertaking, which is a very large thing to do. We invariably ask for capital sufficient to double the output. In this case, if a trebled output is allowed for, £30,000 would be enough. That would take £10,000 for the purchase, £6000 for concentrating upon one site the whole of the gas-works, and £14,000 to provide for the extension of the business.

We know that the present output is something under 9 million cubic feet. Do you see any probability of that being more than trebled within the next thirteen or fourteen years?—I do not. There is no necessity whatever for any such capitalization as is proposed.

Have you anything to say with respect to the way in which the amount alleged to have been paid for the Dipton works has been arrived at?—No; I have no comments to make. All I can say is that, in my opinion, the capital standing in the books of the two Companies (£1620 in one case, and £3500 in the other), fairly represents the full value of the undertakings. It is quite true that the works are sending out between them 9 million cubic feet of gas a year; but they are not fit for it. At Dipton there are two miserable little purifiers, quite unfit to deal with the gas effectively, and at Annfield Plain the retorts are in ruin, the purifiers entirely worn out, and generally the place is in a deplorable condition. Under these circumstances, the Company are altogether unjustified in providing dividends. They should spend their money putting the place in order.

Of course, something must be allowed for goodwill?—The share capital of the Companies is (say) £3000. There is £1500 borrowed money at Annfield, and £1000 at Dipton. If the two Companies had joined together and come here for a Bill for incorporation, it would have been perfectly reasonable to ask that this £3000 should be regarded as original capital, and bear a 10 per cent. dividend. But that would have been all anyone would have dreamed of asking. To ask that the premium upon the purchase of the goodwill and upon the works should be regarded as original capital, and, as such, be entitled to have a large dividend placed upon it, is contrary to anything in my experience. I do not suppose for a moment it will be allowed.

Do you think this is pre-eminently a case in which the promoters should be put upon their good behaviour, and forced to come to Parliament again?—They are certainly not conditions under which they should be allowed to stay a long period from Parliament. These people are new to the neighbourhood; they have no experience of it. They seem to me to be rather drawing the bow at a venture in buying the undertakings at all. They might have waited some time, until they had put their house in order, before applying for a Bill.

In further examination, witness said, on the subject of the sliding-scale, for which he expressed preference, it would not matter whether the capital was treated as 7 per cent. or 5 per cent. He should not like the promoters to go away with the maximum price of 4s. 6d., which they would immediately charge, and then get their shares up to a considerable value before again coming to Parliament. It was quite possible the Local Authority might think it their duty to purchase the property; and to have the price at 4s. 6d. would put the Company in a strong position, either with the consumers or in view of a sale. Supposing the sliding-scale was adopted, the standard price he would suggest was 4s. per 1000 cubic feet, which was about the present figure. The Company would be at liberty to charge, in addition to this, something more for gas supplied through prepayment meters. This would correspond with a dividend of 5 per cent., which was a fair return for the money invested. If they could do well, their dividend would go steadily up; but the consumers would not complain, because the price would go down. With regard to the scheduled agreement, he saw absolutely no reason for any valuation at all. These people had bought their company; and why they should take their profit upon that he could not understand.

Mr. SIMEY: However impartial the arbitrator may be, do you see any protection which the consumer of gas is to get?

Witness: What I feel is this: I cannot seriously consider the agreement—the idea of more money being paid under it. It might be that there is no precedent of any sort. If these people are *bonâ fide* starting a gas company, they have no business to pile into the capital profits other than can legitimately be made out of the business of supplying gas. To let the agreement stand is to say that Parliament approves the idea of these adventurers—speaking without any disrespect at all—making a large profit, and then requiring the gas consumers to pay a dividend upon it. The agreement is radically and altogether wrong; and I cannot discuss the details.

Do you think that this is a case where, if there is no sliding-scale, there should be some restriction of the fees the Directors should receive?—In a well-regulated gas company the interests of the shareholders and the consumers are identical. That is my experience.

Cross-examined by Mr. LLOYD, witness said he would rather have the gas supplied by a non-statutory company than by the statutory one proposed by the Bill; but assuming Parliament passed a proper Act, he would prefer the gas to be supplied by a statutory company.

Mr. LLOYD: As I understand matters, the Bill originally proposed a sliding-scale. We might have been mistaken, but we thought it was in the interests of your clients that the change should be made to the maximum price. As a matter of fact, we prefer the sliding-scale; and, as I understand, you agree that this is best. It becomes really a question of what is the fair amount of capital, dividend, and price. As to capital, how many houses are there in Annfield to-day?

Witness: The population is 14,000; and to get the number of houses I would divide by 5. This would put the number at 2800. I have no idea as to how many of the houses are already supplied with gas; but in this district, where the miners get their coal practically for nothing, and keep their fires burning all night, gas is not so great a necessity as in centres situated like London.

Cross-examination continued: He had not gone into the question as to what meters and fittings would probably be required to be found by the Company; but they would not cost more there than in London. He did not know what was likely to be wanted in the next twelve or fourteen years. The cost worked out at about £300 per million cubic feet. Asked if the Gaslight and Coke Company did not get a 3s. 9d. standard at a time when the actual price of gas was 3s. 6d., and they were entitled to a 10 per cent. dividend, witness replied that they were not trying the case of the Gaslight and Coke Company.

Mr. LLOYD: I agree; but at the actual price of 3s. 6d. you were dividing 10 per cent. when you were entitled to 3s. 9d.

The CHAIRMAN (to witness): With the Money Market in its present state, could you sell the shares of a company like this to pay a dividend of 5 per cent.?

Witness: Yes. It is the prospect of the sliding-scale that is the inducement. With every penny the price goes down, up goes the dividend.

I think you said the chief protection to the consumer would be a standard price and a sliding-scale. You think that practically covers everything?—Yes.

Mr. SIMEY: With the proper capitalization?

Witness: Certainly; that is an essential factor in the case.

Mr. *W. Hardie*, the Engineer and Manager of the Tynemouth Gas Company, said last November he made a report upon the Annfield Plain gas business for the Urban District Council. The existing gas-works were in a very dilapidated condition. Among other things, he went into the question of the cost to the Council of the establishment of new works; and for this purpose he provided for an annual consumption of gas approaching 30 million cubic feet, and for a daily consumption of 135,000 cubic feet. He found it would be necessary to expend £22,500 upon new works, without taking into account the purchase of the old ones. The idea was to put up works that might be easily enlarged. The additional capital required for developing the business would be £12,500. This would provide for a total consumption of 50 million cubic feet per annum, and also for plant and consumers' installations. He next dealt with the question of price, and pointed out that if his scheme were adopted the charge to ordinary consumers ought not to exceed 3s., and to slot-meter consumers 3s. 6d., per 1000 cubic feet.

Mr. LLOYD cross-examined witness with a view to showing that it would take twelve years for the annual consumption to reach 30 million cubic feet, and that his report did not contain any mention of the fact that the Council would have to buy the existing works before embarking upon their own project.

Witness said his estimate was based upon a particular output, and that the old works would have been useful.

Mr. LLOYD: But do you not know that it makes a difference whether you buy works as a going concern or put up your own works?

Witness: That depends upon the price you give.

Mr. FITZGERALD: I have often heard it stated that the Local Government Board do not allow a local body to establish gas-works without first buying up the existing works; but the Board state that there is no rule on the subject.

Mr. LLOYD: Mr. Woodall has stated that no case is known where this practice was not followed.

Mr. FITZGERALD: I cannot help what the local practice is. I am talking about the rule; and I am informed that no such rule exists.

Mr. LLOYD then addressed the Committee on behalf of the promoters. He protested against the attack which his learned friend had seen fit to make upon his clients. These gentlemen were, he said, well known in the City and in the gas world, and he could not find any suggestion, in the correspondence or anywhere else, that this attitude was going to be adopted towards them. He did not, however, propose to reply to these aspersions, because he hoped that Parliament would allow the promoters to set up their proposed business. He recognized that if the total capital were cut down to £48,000—that was to say, £36,000 in shares and £12,000 on loan—it should be sufficient to carry on the undertaking for twelve or fourteen years. This was in view of the fact that the district of Medomsley, which had been inadvertently included in the area of the Bill, had been abandoned. He would further suggest that a standard price of 4s. per 1000 cubic feet, and a general dividend of 7 per cent., would be enough. If it was thought that there should be a maximum price, then he should fix it at 4s. 6d., with the maximum dividend at 7 per cent. They, however, all preferred the sliding-scale as being the more modern principle. With regard to the agreement, Counsel was genuinely anxious to ascertain, if he could, the fair price as between the outgoing and the incoming people; and it struck him that the best way of doing so was by arbitration. He recognized, however, that if both sides were not properly represented, the arbitrator could not have the fullest materials before him. Therefore he suggested that the Local Authority should be heard fully on the question of price. He was quite prepared to agree that the purchase price, when settled by the arbitrator, should be paid and satisfied, at the option of the Company, by the issue of shares or by cash.

The CHAIRMAN said the Committee were prepared to pass the preamble of the Bill subject to the following conditions: Medomsley to be taken out; and the other areas to be included on the understanding that the Company in the North was communicated with, so that, if they had any objection to make, they could do so before the Committee of the other House. The arbitration clause to be amended so as to cut out the sum of £10,000 as suggested, and to contain a provision that the Local Authority were to have the right to be present to take part in the proceedings and examine books and papers. A local director was to be chosen, if he could be obtained. The standard price to be 4s. per 1000 cubic feet, and the standard dividend 7 per cent. The capital to be £36,000 ordinary and £12,000 borrowed. Mr. Fitzgerald had asked if the Committee would insert some provision in the Bill that the maximum amount to be divided among the Directors could be ascertained; and they proposed the sum of £200 as the maximum.

Thursday, March 14.

This morning the clauses were considered; and the Bill, as amended, was ordered to be reported.

Winding-Up the Beverley Water Company.

Last Tuesday, the above matter came before Mr. Justice Parker, in the Chancery Division of the High Court of Justice. Mr. A. Adams said it was a petition by an unregistered Company incorporated by Special Act of Parliament in 1881 for supplying water to the Borough of Beverley, the Corporation of which place had, pursuant to the provisions of the Public Health Act, and with the sanction of the Local Government Board, taken over the business—the Company merely continuing in existence for the purpose of being wound up. The Corporation were the Urban Sanitary Authority for the district of Beverley, and negotiations took place last year with the view to the Corporation acquiring the water undertaking. In May the Company agreed to sell it for £20,850, payable two months after the sanction of the Local Government Board had been obtained for raising the necessary loan. This sanction was given on the 2nd of January last. The agreement provided that the Company should not continue to supply water in Beverley, and should take immediate steps for winding up. All the debenture holders had consented to being paid off; and the £20,850 included the amounts due to them. There was no opposition; and his Lordship made the usual winding-up order.

Harrogate Water-Works Expenditure.—The Harrogate Town Council have agreed to apply to the Local Government Board for their sanction to the borrowing of £100,000 for the completion of the water-works at Masham. The cost of nearly every item in connection with the scheme has considerably exceeded the estimates; the total excess amounting to the sum it is now desired to raise—or about 30 per cent. Even this, however, Alderman Milner, the Chairman of the Water Committee, declines to absolutely guarantee will cover the whole of the outlay. The cost of land for reservoirs, which was estimated at £10,625, actually came out at £27,225.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS INQUIRY.

The Second and Third Days' Proceedings.

The Committee of the Nottingham City Council appointed to inquire into the working of the gas undertaking during the past five years, held two sittings last week—on Tuesday and Friday. The members of the Committee are: The Mayor (Alderman J. A. H. Green), Mr. E. L. Manning, Mr. S. Cook, Mr. E. N. Elborne, and Dr. Dabell.

Mr. *J. H. Brown*, the Gas Engineer, on Tuesday continued his evidence, the first part of which was given in last week's issue of the "JOURNAL" (p. 694). At the opening, in answer to an invitation by the Mayor to give them, if he wished to do so, instances of the Committee not accepting advice he had tendered with regard to plant, witness said that, looking into this phase of the question, it appeared to be a very much larger matter than he at first anticipated. He could give some information now; but he would much prefer to do so at a later sitting. Copies of some reports did not appear to exist either in his own reports or on the minutes; but he believed that if he had time he could find them in the older books of the undertaking. It was thereupon decided to defer the matter till a later sitting. The Mayor then asked Mr. Brown whether a draft of the minutes was always sent to him for his approval, and for him to make any observation upon, before they were entered up. Witness answered that this was the case now, but he did not think it always had been. He could not, however, say when the practice was commenced. Sometimes he had made remarks that the minutes did not convey exactly what he had meant; and since this time a draft had invariably been sent to him for final approval. This he returned with any amendments that he might think ought to be made. Coming to the question of the plant, Mr. Brown was interrogated as to an apparent inconsistency between his reports of March and June, 1904, and June, 1905. In the latter, and in 1906, he stated that the buildings and plant were in a good and efficient state; while in 1903 he said the works were in a very unsatisfactory condition—in fact, that they were not working to more than one-seventh of their capacity, and it was with great difficulty the wants of the city were supplied. No minutes of reconstructive work were forthcoming; yet later reports referred to the satisfactory and efficient working of the plant. Witness replied that the "satisfactory and efficient" phrase was merely a method of speaking, which would be found in all gas manager's reports. But the necessary repairs were not being carried out. The Mayor remarked that money seemed to be spent fairly liberally on upkeep; and if there was any neglect, it was Mr. Brown's duty to himself, as well as to the Committee and to the town, to say something about necessary repairs not being carried out. Witness said that the Chairman was the Committee; and when he had mentioned the matter to him, he thought his duty was done. It never occurred to him that it would be desirable to have something in black and white to relieve him of responsibility. In December, 1904, specifications were being prepared for repair work required to be done in the spring of 1905.

The MAYOR pointed out that this work was not done; but, nevertheless, in his report of June, 1905, the Engineer had said everything was good and efficient.

Mr. ELBORNE said he supposed the difficulty was that they had robbed the plant to make a profit.

The MAYOR: We are all of the opinion that more work ought to have been done. The question is as to whose fault it was that it was not done. In 1903, you advised the installation of a carburetted water-gas plant. In 1904, you came to the conclusion that it could not be adopted with economic advantage. In 1905, you put one up.

Witness said that in 1903 he presumed the Committee would continue supplying high-power gas; and he had assumed that the holders would be increased to adequate dimensions.

The MAYOR pointed out that a so-called experimental gas plant was erected in 1903, at a cost of £1030; and in 1905 they found a minute about oil for a carburetted water-gas plant, which in the meantime had come into existence, or was coming into existence, and for the authorization of which there was no minute.

Witness said he would go into the whole history of the manufacture of water gas. The late Engineer erected a water-gas plant ten years ago at Basford; and when he (Mr. Brown) came to Nottingham in 1903, he obtained the consent of the Committee to put the plant into working order. Some water gas was made with it; and sufficiently satisfactory results were obtained to justify the expenditure of £1000 upon bringing the plant up to date, but actually not half this amount was spent. This outlay was the one referred to as the erection of an experimental plant at Eastcroft. The results obtained were very remarkable—so much so that the works had been visited by many gas engineers. The Gas Committee sanctioned the assistance of three lads on the laboratory work in connection with the experiments; and they also consented to his reading a paper before the Institution of Gas Engineers. The paper was not written until after the work was practically completed; and it was only a matter of a few days to compile the statistics from the results that had already been obtained. There was a blue water-gas plant at Ilford; and the circumstances at Nottingham made him think it would be a good thing for them also. The experiments were made with the idea of benefiting the Nottingham gas undertaking, and not "on account of his own scientific keenness." When the successful results were obtained, and had been confirmed by other gas engineers, he submitted a copy to the Gas Committee; and they decided that arrangements should be made for dealing with this process on a much larger scale. In the next extension, provision was made for the cost of the water-gas plant, and the special plant required to adapt the process. About this time, the Sutton authorities were constructing a retort-house; and they asked the Nottingham Gas Committee to allow him to advise them. He, however, absolutely refused till it was understood that all the fees and emoluments whatever he should get for advising as to the erection of the plant should be handed over to the Corporation accounts. It had been stated by some engineers who had seen what was called the £1000 plant at Nottingham that it was an infringement of a German patent. He was about this time instructed to visit other places and see what was being done; and as the result, he was convinced that the plant they had on order might be modified to make it capable of producing blue and carburetted water gas. The Gas Committee not having decided to increase the facilities for the output of coal gas, and it being evident they would be in difficulties in the approaching winter on this account, he advised the Committee that it would be greatly to their advantage to manufacture carburetted water gas with this apparatus when the works were being strained to the utmost in midwinter. There was no written report to this effect. It was all subject to the Committee being able to purchase the necessary quantity of gas oil at a suitable price. Drawings and sketches were prepared, showing at what cost the plant could be modified; and he ascertained at what price they could purchase oil. He reported to the Committee on Sept. 11, when he was instructed to complete and purchase the oil. It was arranged that the cost of these alterations should be included as an extra on the existing contract. Practically the whole of the negotiations were submitted to the Chairman at the time. Having arranged a suitable price, the order was sent to the contractors; and this was put in the Committee order book, and signed "Edward Harlow, Chairman." The estimated cost of the work was £2250. The Chairman signed it just before the Committee meeting; and it was not put before the Committee. It was not considered a very large sum; and it was the obvious conclusion to the minutes of the Gas Committee for purchasing the gas oil. It ought not to be taken out of its surroundings. The oil would not have been of any use if they had not had this plant.

The MAYOR: Summing the whole thing up, are we to take it that the Committee were perfectly cognizant of what was being done, both before the order was given and during the progress of the construction of the plant?

Witness: I should not like to answer for the rest of the Committee. So far as the Chairman was concerned, he was quite conversant with what was being done; and so were some of the Committee. It had been mentioned to the Committee on two or three occasions; and one or two members of the Committee actually visited similar plants.

In reply to some questions regarding the management of the chemical works at Giltbrook, witness stated that when he went to Nottingham, he found a very extraordinary state of affairs existing. When he wished to make investigations, the Manager of the chemical works accused him of trying to pick his brains, and said he ought to be put in entire charge of the plant. Witness found that the material that was being sent away was not as it should be, and that the standard solutions and the chemical appearance were most unsatisfactory. On one occasion he arranged to inspect some material. Contrary to his instructions, it was despatched; and he had it stopped in transit. On examination, he found it was not what it ought to be; and in the end the Superintendent was discharged. It was afterwards found necessary to rebuild some portion of the plant. Since that time a large amount of money had been spent; and everything was now in a satisfactory condition, considering the site and the plant they had to deal with.

Mr. *Brown* was again under examination during the whole of Friday's sitting; the subject being the quality of the gas. In the first place, however, witness was asked to clear up the matter of the accuracy or otherwise of the minutes of the Gas Committee's meetings; and he said he found that in answering questions in an off-hand manner at the previous sitting he made statements which he would like to modify to some extent. With regard to the minutes, up to the time he came to Nottingham, no draft minutes had been sent to the Gas Engineer's office. Generally speaking, he considered the minutes outside the Engineer's responsibility, and solely a matter for the minute clerk. Some matters had been dealt with at the meetings of the Gas Committee which were outside the scope of the Committee; and no minutes of these had been taken. Witness was then asked to give, if he desired to do so, instances in which the Gas Committee had not accepted his advice; and in reply he said that these cases were not of very frequent occurrence. Indeed, whenever his suggestions had been brought before the Committee and received full discussion, they had been almost invariably accepted. The principal matters in which the Committee had not carried out his suggestions were in regard to the proposed new site for the chemical works, and the further provision of storage accommodation for gas—questions of policy, involving a large outlay. He also advised that a department should be organized to take under their care the consumers' burners, &c., to provide burners suitable to the quality of the gas before the proposed reduction in the candle power was carried out, and to attend to the complaints made by customers. This was not done. Further, he had desired that the Gas Department should enjoy the same privilege as the Water Department, and have the power to inspect all the internal pipes and fittings in new houses; and he had reported upon the desirability of complaints respecting the quality of the gas being attended to in the first instance by the Engineer. This advice he had given several times—the first occasion in 1903; and he was convinced that had these recommendations been carried out, the difficulties which occurred in the autumn of 1905 would have been of much shorter duration. In regard, however, to the seeking of parliamentary powers to inspect the internal fittings of houses, his requirements, in deference to a public meeting which was held, were modified to such an extent as to be of doubtful value. As to the statements which were made in his annual report with regard to the buildings and plant, in his report for 1906 one paragraph read: "The buildings, plant, &c., and machinery generally, are in a good and efficient state of repair." If any report did not include some such statement with reference to the plant and the buildings—it referred in this instance to practically over £1,000,000 worth of plant, not only works, but show-rooms, offices, railway waggons, locomotives, &c.—the public would imagine they were allowing the plant to get into an unsatisfactory state of repair. If the whole of the repairs which had been neglected had been dealt with, it would not have represented more than £25,000 out of £1,000,000 worth of plant. The report in 1906 also referred to the retorts at Eastcroft and at Basford being near the end of their useful life.

The MAYOR: What surprised me at the last sitting was that you seemed to doubt whether the condition of the plant was or was not responsible for the complaints in 1905. I expected you to say that in your opinion the plant had not much to do with it.

Witness: Decidedly; I have always contended that.

The MAYOR: If we had arrived at this point on Tuesday, we should have been much happier. You have given us some instances in which the Committee disregarded your advice. Had the disregard of that advice anything to do with the quality of the gas, and the results of that quality, in 1904, 1905, and 1906?

Witness: In 1905, the work neglected at Eastcroft had certainly something to do with the trouble experienced at the end of that year. Had my advice been followed as to the method of dealing with the complaints, as reported to the Committee in March, 1903, and again in December, 1905, the difficulty we experienced in 1905 would have been of much shorter duration.

In answer to further questions, witness said the nominal candle power in 1902 was 18½; but actually it fluctuated between 14 and 18. In 1903, he recommended that it should at once be reduced to 17, and gradually to 15, and urged that the Gas Department should take the question of burners in hand before the quality was reduced below 16 candles, and that changes should be made gradually, with a minimum of 16 candles for the present. The reduction of the candle power ought, in his view, to have been accompanied by the care of the consumers' fittings and burners. In 1903, a reduction was made in the candle power from 17½ to 16; and the Engineer was given instructions for the care and inspection of burners. He did not think the Committee resolved not to appoint inspectors for this purpose by any actual resolution after having decided to appoint them. On one or two occasions, he was instructed to appoint them; but before he had had an opportunity to carry out the instructions, the matter had been allowed to stand over. This was more on account of the spirit and general understanding of the Committee than any written order.

The MAYOR: In September, 1904, you mention that there was a further reduction in the candle power of the gas below 16 with the consent of the Committee. That consent appears nowhere in the minute-book?

Witness said the consent did not appear in the minute-book; but it was in the report by the Gas Committee in October of that year.

The MAYOR read the report referred to, which stated that gas of between 14 and 15 candle power was found good enough for the greater number of towns in Great Britain. The Committee thought 16-candle power gas should be good enough for Nottingham; but they did not recommend a further reduction at present.

Witness then said that there was really no definite instruction. The matter was discussed from time to time; and when the Committee made that report the gas was down below 16 candles. Every fortnight the candle power of the gas was reported upon to the Committee; and the matter was discussed.

Some particulars were next given by witness with regard to the method of testing the gas; and then there was read the record of the complaints, which in 1902 were 13,785—a number that decreased to 13,026 in the year ending March, 1903, and increased to 13,431 in the following year. But the number of consumers having greatly grown, the proportion of complaints received during the year the candle power was first reduced was less than ever previously—22·63 per cent., compared with 26·45 per cent. in 1902, when the gas was 18-candle power.

Mr. ELBORNE pointed out that upon the question of burners, the Committee not only disregarded the advice of Mr. Brown, but also of their expert, Sir George Livesey, who, in his final report, said that the nominal quality of the gas was not the great consideration—it was the manner in which it was burnt.

Mr. COOK drew attention to the fact that Mr. Brown had recommended that, before the candle power be reduced, new burners should be fitted; but although his advice was not accepted, and the candle power of the gas was reduced without the provision of new burners, complaints were actually less than ever when the power of the gas was lowered. He asked whether witness could explain the aspect.

Witness said it was beyond him. The most severe period from the complaint point of view was the three months commencing in October, 1905—when the irregularities were going on at Eastcroft. In December of that year, it was discovered that an official responsible for the illuminating power at Eastcroft had given instructions for it to be entered inaccurately. Instructions had been given which were entirely contrary to those he had received from witness. This had been going on for probably four months at different periods. The results which were sent to the George Street office had shown the candle power of the gas to be perfectly satisfactory; but in actual fact is was much lower than that booked. Certain complaints came to his knowledge which he could not understand; and for the next few weeks he attended to a very large number of complaints himself. Still he could not find an explanation. In one case in particular the consumer, who lived in a very large house in a certain district, telephoned about seven o'clock in the evening. Witness went to his house as rapidly as possible—he was there in about twenty minutes—and when he arrived they said it was no use his coming for he had "turned on" the gas before he got there. The complaint was that the pressure was insufficient. He found the meter was passing double its right quantity, and had it changed. But during the time this was being done they had a similar complaint. It had been stated that there had been some tampering with the mains in this particular district—that the mains had been flooded with water. In fact, it was the Chairman who said it. He (witness) took the workman who was responsible for the condition of the syphons; and they went through the whole extent of the main from the works to the house. The syphons were perfectly satisfactory. He had previously been to the Eastcroft works, and asked whether they were satisfied with the gas that evening. He was shown the figures, which were perfectly satisfactory. He had some further tests made at George Street; and the gas appeared to be all right. Later he telephoned to the works; and from the result of his inquiries, and pressing the man who was in charge, he learned that the gas had not been as satisfactory as it ought to have been at a certain time during the evening. He asked him at once why it was not shown on the sheet; and he said they had instructions to book it at a certain figure, whatever the candle power was. On the following morning, he sent for the official responsible for the works and the foreman to the George Street offices; and they were asked to explain the reason why they had not carried out his instructions. The responsible official stated that he knew he was going contrary to instructions. "I took the responsibility on my own shoulders; and I must abide by it," he said. I asked him if he had taken my responsibility on his shoulders. He said he had given instructions to have the tests recorded at figures which were not accurate.

The MAYOR: What do you think was the object?

Witness replied that to do justice to this official, it was necessary to go back to the beginning of 1905. During that period, one of the persons who was responsible to him for presenting the results of the investigations of the complaints received again called his attention to the fact that for some weeks previously a larger number than usual had been found in a certain district. These led up to his personally investigating the matter, and getting at the cause of the trouble. In January or February, 1905, the inclined retorts were in an unsatisfactory condition; and a certain number needed repairing. It had been decided that these repairs were necessary if the Committee were going to continue the policy of shutting down the retort-houses on the Sunday afternoon shift. If the retorts were not to be shut down, the plant would be capable of working throughout the summer and winter, and would then require renewing in January, 1906. The Committee debated the question for some time; and it was eventually decided to work the retort-houses throughout the summer months. The repairs were, therefore, postponed until the following year. When July came, the Committee decided to shut down the retort plant for the summer; the carbonizing results having fallen from 10,738 to 8767 feet per ton. It was an understood thing that if the results were satisfactory at the end of the year, the question of an increase in the salary of the official in charge should be brought before the Committee. This was the tacit understanding. It was found from the results that the official had adopted measures which were certainly reprehensible; and witness had no doubt this was the main motive for doing these things. There was, so far as he was aware, no other reason than a possible increase of salary.

Mr. MANNING: To come to the one important point in respect of the gas undertaking, is it possible for manipulation to take place now?

Witness: I think every possible precaution is adopted. One trustworthy official is sent periodically to make tests in the works themselves. Tests are being taken in different parts of the town unknown to anyone but myself.

The inquiry was then adjourned until to-day (Tuesday).

SHEFFIELD UNITED GASLIGHT COMPANY.

Increase in Consumption and Decrease in Price.

The Ordinary General Meeting of this Company was held on Monday of last week, under the presidency of Mr. WILSON MAPPIN, J.P., in the absence of Sir F. T. Mappin, Bart., the Chairman.

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) read the notice convening the meeting; and the report and accounts—noticed in the "JOURNAL," Feb. 19, p. 482—were taken as read.

The CHAIRMAN said he was sure they would all regret that Sir Frederick Mappin could not be present. As they would have gathered from the report, the business still continued to expand in a most satisfactory manner; there having been an increase in the quantity of gas sold of 84,424,000 cubic feet, or 5·64 per cent. more than in the corresponding half year of 1905. The receipts for the same period, however, were £291 less, owing to the reduction in price. After deducting the dividend, they would have a surplus profit on the half-year's working of £10,603 to be added to the unappropriated balance, which would then be £95,793 in addition to thereserve fund of £86,848, which stood at its maximum. The quality of the gas had been quite equal to that supplied for many years past; the average of 1153 tests being 17 38 candles. They carbonized 4426 tons more coal than in the corresponding period of 1905. The stokers' wages were £1097 more, and repairs of mains and services £245 more; but repairs of works cost £2957 less. They received for coke £1205 more, and £61 more for tar; but less for sulphate of ammonia by £930, and less for hire of railway waggons by £118. The other items did not call for any particular comment. There were 466 additional meters fixed during the year (including two 1000-light and one 2000-light), and 58 additional gas-engines, varying from 1 to 500 H.P. In the past half year, 1193 gas-fires, 1053 boiling and other stoves, and 11,111 incandescent burners were sold. He had noticed that 94,000 tons more coal was sent to Hull for shipment from South Yorkshire collieries in January and February this year than in the same months of 1906—the total tonnage being 761,360 this year, and 667,296 last year; and he thought the Company, and, in fact, all manufacturers in Sheffield, had grave cause for complaint against the Railway Companies, who, in order to carry this large quantity of fuel for shipment to foreign countries, had neglected local traffic, causing considerable loss and inconvenience to works whose sidings were on their lines, and who were thus dependent on them for the proper delivery of coal. Owing to these serious delays, the Company all through the winter had had to unload coal on Sundays; but on the last two Sundays the Great Central Company, without any previous notice, put no coal into their sidings. Such treatment could not be lightly passed over; and they would have to consider what steps they could take in order to compel the Railway Companies to fulfil their duties in a more satisfactory manner. He was glad that this question of delays had been taken up by the Sheffield Chamber of Commerce; and he trusted they would not let it rest until some proper understanding was arrived at with the Railway Companies. It was altogether unreasonable and unfair that home traders should suffer in order that extra quantities of coal should be delivered to the foreigner. Now that a further reduction in the price of the Company's gas was to take place in April, he hoped the Corporation would proceed cautiously in the proposed lighting of some of the

Sheffield streets by electricity. The cost of electrical street lighting in Shoreditch was £749 19s. per mile, in Islington £893, in St. Pancras £236, in Hampstead £492 15s., in Marylebone £727 16s., in Fulham £880, in Southwark £949, and in Hackney £390 16s. For incandescent gas street lighting, Lewisham paid £72 per mile, Deptford £74, Greenwich £79, Camberwell £90, and Lambeth £91; while at Sheffield, with gas at 1s. per 1000 cubic feet (as it would be after this month), the cost for gas supplied to each single-burner lamp would only be 14s. 11d. per annum. As no record had been kept of the mileage of streets lit, the comparison per mile could not be made; but Sheffield gas was at most only half the price of that of the places named. In St. Pancras, in the twelve months ended Lady-day, 1905, £8839 was paid for gas, and £4426 for electricity. For the year ended Lady-day, 1906, the amount paid for gas was £3734, and that for electricity was £13,376. In the report of the Streets Committee of the Corporation of the City of London, who had reverted to gas in Queen Victoria Street, Fleet Street, and Monument Street, the annual saving was £490. In Bristol, there had been spent on street electric lighting £11,891; whereas the Gas Company had offered to light the same area with improved gas-lamps, having 100-candle power each, for £2830—or a saving of £9000 per annum. His desire was to keep down the rates of the city, and not see money wasted. He concluded by moving the adoption of the report and accounts.

The motion was seconded by Mr. H. K. STEPHENSON, and carried unanimously.

Dividends at the rate of 5 per cent. for the half year on stocks "A," "B," and "C" were declared.

The CHAIRMAN, in acknowledging a vote of thanks to the Board and to the officials, said that the latter had lately had an anxious time, owing to the delays on the part of the Railway Companies, and also to short deliveries of coal during busy months by the contractors—there having been 10,963 tons less delivered in January and February this year than in the same months of last year.

ILFORD GAS COMPANY.

New Offices and Show-Room—Ten Years' Progress.

The Half-Yearly Meeting of this Company was held at the Company's new Offices and Show-Room, Broadway, Ilford, last Tuesday—Mr. W. ASHMOLE, the Chairman of the Company, presiding.

The CHAIRMAN, in moving the adoption of the report and accounts for the six months ending Dec. 31 last, said he had great pleasure in welcoming the proprietors, on behalf of the Board, to the first half-yearly meeting in the new offices of the Company, and in expressing the hope that the prosperity which had marked the undertaking during the 68 years which had elapsed since its initiation would be maintained, and even eclipsed, in the new premises. The new offices had afforded much-needed relief to the secretarial staff; and the show-room was fulfilling in a very gratifying way the purpose for which it was intended. The existence of this very valuable educational centre in the heart of the town could not fail to have a marked effect upon the future progress of the Company. Believing they would interest the stockholders, and with a view to illustrating the progressive character of the undertaking, he had obtained the figures of the last eleven years, showing the volume of gas sold. In 1896, it was 47,504,900 cubic feet; in 1900, 128,322,300 cubic feet; in 1905, 263,800,500 cubic feet; and in 1906, 288,919,000 cubic feet. These figures showed the very remarkable increase of 508 per cent. in the volume of gas sold during the last ten years; and although the Company could not hope to continue expanding at this phenomenal rate, the output last year—being as it was an increase over the preceding year of more than 25 million cubic feet—afforded no ground for anxiety for the future, but, on the other hand, clearly indicated the strength of the Company's position in the face of competition. Turning to the accounts, he had to congratulate the stockholders on another satisfactory balance-sheet. Notwithstanding extra expenditure on account of the new offices and show-room, the capital account showed an increase of less than £11,000 over the previous year; and as the consumption of gas had increased during the year by 25 millions, it would be seen that a further reduction had been made in the ratio of capital expended to the volume of gas sold—amounting to nearly 5 per cent. The continued improvement in this respect was a source of gratification to the Board; and the proprietors might rely upon expenditure under this head receiving very careful consideration before being incurred. The sum of £2055 had been written off for depreciation of meters and stoves. The revenue account might also be considered satisfactory. The expenditure on coal had been proportionately higher than for the corresponding half of last year; but this was accounted for partly by some comparatively light deliveries of the lower-priced coals in proportion to the bulk, and partly by labour charges in dealing with increased stocks. On the other side of the account, an increased revenue from gas was shown amounting to £2173; meter and stove rents had produced a further increase of £321; and residuals £422—leaving a very satisfactory balance of £8607 to be carried to the profit and loss account. During the half year 643 new meters, 460 cookers, and 250 gas-fires had been fixed; and he was pleased to say that new consumers were still being obtained in good numbers. During the last month of the past year, the Company commenced to supply gas to the London County Council Asylum at Claybury; and it was hoped that this new and substantial contract would prove of benefit to all concerned.

The report and accounts were adopted, and dividends for the half year at the rates of 6 per cent. per annum on the "A" and "C" stocks, and 4½ per cent. per annum on the "B" stock (less income-tax) were declared.

The retiring Directors and Auditor were unanimously re-elected; and votes of thanks to the Directors, officers, staff, and workmen concluded the meeting.

Air Gas, Limited, is the title of a Company formed with a capital of £25,000, in £1 shares, to adopt an agreement with the Patent Appliances Syndicate, Limited, and to carry on the business of gas, electrical, and mechanical engineers, &c.

QUALITY OF STRETFORD GAS.

In the notice of the last half-yearly meeting of the Stretford Gas Company which appeared in the "JOURNAL" for the 12th inst., it was mentioned that the Deputy-Chairman (Mr. W. A. Nicholls), in seconding the motion for the adoption of the report, referred to some attacks which had been made upon the Company in a local paper. He was alluding mainly to correspondence which had been going on since early in the year between Mr. Cotsworth, a consumer in Urmston (a district supplied by the Company), and Mr. H. Kendrick, the Secretary, in regard to the quality of the gas. Mr. Cotsworth began by complaining that there was a loss of illuminating power to the extent of 4 candles in the travel of the gas from Stretford to his house at Urmston, or 6 candles lower than Manchester gas. He presumed the "large admixture of water gas" was responsible for this; and he thought the heavy drop in candle power—practically 25 per cent.—showed that "any enrichment does not carry." On receipt of this letter, it was considered by the Board, who instructed Mr. Kendrick to ask the writer to furnish them with answers to the following questions: "(1) What apparatus are you using to make your tests for illuminating power? (2) Have the tests been made at the same time of the day in each series, or simultaneously at the different places mentioned? (3) What are the candle powers you have obtained at the various places?" Mr. Kendrick, in a subsequent letter, stated that one of the Company's servants would be investigating complaints which had been made by members of the District Council in regard to the gas, and he hoped Mr. Cotsworth would allow him to test the pressures and examine the burners at his house, so that the cause of his complaint might be traced. As Mr. Cotsworth was using ordinary flat-flame burners in some rooms, Mr. Kendrick enclosed a few of Bray's adjustable burners, No. 4 bottom with No. 8 top, as recommended by the Metropolitan Gas Referees, which he said were found the most suitable for the Company's gas when consumed at the rate of slightly over 4 cubic feet per hour. Mr. Cotsworth replied to the questions put to him. He said that he had used a Thorp and Tasker "jet" photometer, which gave absolutely correct readings in candle power where only coal gas was employed, but was not accurate where there was any admixture of water gas. He was, however, having tests made with various percentages of water gas, to ascertain to what extent the illuminating power of the gas was affected. Meanwhile, he sent the results of his tests, which averaged 18 candles in Manchester, 16 candles in Stretford, and 12 candles at his house. He said it was this loss of 25 per cent. in candle power between Stretford and Urmston, and the difference of 33⅓ per cent. as compared with Manchester, that concerned him.

The foregoing may be taken as the statement of the complainant's case. Mr. Kendrick set himself to replying to it in a letter to the local paper, in the course of which he said: "We consider that the quality of the gas we are supplying is the most suitable for the needs of our consumers; and it will compare favourably with that supplied by our neighbours. We can supply a higher quality of gas, but at a higher cost, which would result in an injustice to the users of the incandescent burner, who number considerably over 80 per cent. of the population. From experiments, it has been found that 20-candle gas gives very little more light than 16-candle gas when consumed in the incandescent burner, while the cost would be at least 6d. per 1000 cubic feet more. If the best flat-flame burners (Bray's adjustable) are used, a fair light can be obtained even with gas of much less quality than that supplied by this Company. . . . Our inspectors have called on certain gentlemen in Urmston to examine their burners, &c. They were refused admittance at one house; at another they found the incandescent burners choked with dirt; at a third the mantles in use were three sizes too large for the burners; and at a fourth a stoppage was found in the dining-room pendant. At one house the main complaint was about the cooker, which required overhauling and cleaning. Here also a No. 6 Bray burner was taken off and a No. 4 and 8 adjustable fixed, with an improvement in the light obtained at less consumption. At another house nothing wrong could be found; but the tenant insisted that the gas was bad. At two houses we were informed that they had no personal complaint to make, but were voicing complaints made by other people. Where the pressures were taken, they averaged rather more than 2 inches (water-gauge), which is ample for all purposes, provided the piping, fittings, and burners are in fair order." Mr. Kendrick added that if the consumers would send their complaints direct to the Company, they would be investigated by him, and one and all would have the benefit of his advice and experience.

Replying to Mr. Cotsworth, Mr. Kendrick remarked first that his Company could not admit the accuracy of the tests sent. The Manchester gas was probably all coal gas, the average illuminating power of which was returned by the Gas Committee at 15·7 candles, and not 18 candles as stated. The figures given for the Company's gas were so palpably wrong that they could not admit 12-candle power at Urmston. Their own experience in a long series of tests between the works and a point two miles distant (half-a-mile further than Mr. Cotsworth's house) proved conclusively that the loss on this length of the main was barely 0·5 candle. With regard to the photometer, after admitting that it was made to test coal gas only, why, asked Mr. Kendrick, was it used to base an argument upon inaccurate results? In answer to the suggestion that water gas was responsible for the supposed drop in illuminating power, Mr. Kendrick said his correspondent was evidently not aware that no one in the South-East Lancashire area mixed "blue" water gas with the coal gas, but only carburetted water gas, the illuminating power of which would be found to be from 21 to 25 candles. That carburetted water gas, when mixed with coal gas, was permanent after travelling long distances, was proved beyond all doubt by comparing the published returns of the gas authorities and the official gas examiners in Liverpool, Leeds, Birmingham, and London, the gas in each case being tested several miles away from the gas-works supplying it. Dealing, finally, with the testing of the Company's gas, Mr. Kendrick pointed out that, according to their Acts of 1862 and 1877, the place specified was the gas-works; and that the Gas Referees prescribed a "bar," and not a "jet," photometer—the latter being, at best, when applicable, only an approximate test. Testing the Company's

gas by the bar photometer, its illuminating power had averaged between 18½ and 19 candles during the month of December last. In conclusion, Mr. Kendrick expressed regret that there should be any dissatisfaction in the Urmston area; but he thought the fault would most likely be found in the consumers' burners and fittings.

In subsequent correspondence, the different points raised were further argued between the parties, and it closed with a letter addressed by Mr. Cotsworth to the local paper, in which he re-asserted that the jet photometer was a "suitable instrument," and "approximately correct," for making a comparison test; and he challenged Mr. Kendrick to prove that it was unsuitable. As to the burners sent to him, he said he had had them "officially tested," and found that they consumed 9¼ cubic feet of gas per hour, which was equal to gas at 4s. 6d. per 1000 cubic feet. He concluded by expressing his intention, when the gas was bad, of stating his case before the County Justices.

PRICE OF GAS AT CHESTERFIELD.

In the opinion of Mr. Lancaster, a member of the Chesterfield Town Council, the present charges for gas—3s. 2d. per 1000 cubic feet for illuminating purposes, 2s. 6d. for power, and 4s. for prepayment consumers—considering Chesterfield is on the top of one of the finest gas-coal fields in the world, are "abominable and extortionate." When he gave expression to this view, Alderman Clayton, the Chairman of the Gas Committee, said they were fully alive to the importance of reducing the price of gas, and directly they were in a position to do so they would. There had, however, been a lot of heavy expenditure lately. A loan of £3000 had to be paid back in two years; and this had prevented the price from being reduced. Mr. Jacques pointed out that not only had the Chesterfield Gas and Water Board to pay for the old works, of which there was not one stone left upon another, but the new retort-house had been fitted up with entirely fresh retorts, and purifying apparatus had been erected. In fact, the whole thing had been renewed, and the productive capacity of the works increased from about 385,000 cubic feet to 1,000,000 feet per day. The extra capital expended had to be repaid, in addition to the old capital and the premium paid by the Board when the old works were taken over. When the new retorts were put down a short time ago, the Local Government Board would not allow a loan for a longer period than two years; and at that time on each 1000 cubic feet of gas produced they had to pay 2s. as capital and interest, while in addition there was another 3d. per 1000 feet for rates and taxes—making 2s. 3d. which the Board had to pay before they had a penny for the purchase of coal and the manufacture of the gas.

PRESENTATION TO MR. A. F. WILSON.

Progress of the Aldershot Gas and Water Company.

The completion by Mr. A. F. Wilson, the Chairman of the Aldershot Gas and Water Company, of 25 years' tenure of the office, was recently made the occasion of a pleasant gathering, at which the Company's employees, to the number of rather more than a hundred, offered their congratulations to him, and asked his acceptance of an illuminated address bearing their signatures, and also a loving-cup suitably inscribed, as tokens of their esteem and regard. Mr. R. W. Edwards, the General Manager of the Company and the Chairman of the Testimonial Committee, presided; and, in addition to Mr. Wilson, three members of the Board and most of the employees were present. Mr. Edwards, in opening the proceedings, said Mr. Wilson was elected Chairman of the Company on March 8, 1882; but it was in 1874 that he first became associated with Aldershot. A connection extending over so long a period naturally appealed to one; and therefore he would make a short comparison of the position of the Company then and now. In 1874 the quantity of coal carbonized was about 2000 tons; whereas during the past year it had totalled to nearly 26,000 tons. In 1874 the quantity of water pumped was about 20 million gallons; while last year they had exceeded 400 million gallons. He mentioned these two points to show what Mr. Wilson had done, and how he had assisted in the progress of the Company. Thirty-two years ago electric light was unknown; but now the conditions of their business had altered. To-day they had keen competition, and it was going to be keener; the Chairman had already realized it. There was another point on which he wished to congratulate Mr. Wilson—the development of their water supply. He had been the pioneer of the water supply of Aldershot, and had consequently done a great service to the Company and the town. In conclusion, on behalf of the employees, he asked their worthy Chairman's acceptance of an illuminated address and a loving-cup, as representing the loyalty, esteem, and respect which the Company's servants had for him. Moreover, they all joined in wishing him long life, health, and happiness. In acknowledging the presentation, Mr. Wilson gave an interesting sketch of his career from the time when, in 1853, he entered the service of the Dundee Gas Company as a clerk. In 1862 he came to London to take the position of Deputy Superintendent Engineer of the Phœnix Gas Company; he was subsequently sent to South America by Mr. (now Sir John) Aird; and in 1873 he was invited to Aldershot. He concluded by advising young men to be sensible and thoughtful, and always to push on. Congratulatory remarks were made by Dr. Stroyan and Mr. W. T. Robertson (Directors), and the pleasant function closed with a vote of thanks to Mr. Edwards, proposed by Mr. Wilson, who paid a tribute to his ability as the Company's Manager, and expressed his personal esteem for him.

The Nelson Town Council have applied to the Local Government Board for sanction to borrow £22,000 for gas cooking-stoves and additions to the existing gas-works. The carburetted water-gas plant decided upon some time ago is to be installed at the Brierfield works by Messrs. Humphreys and Glasgow. It has been rendered necessary owing to the large increase in the winter consumption of gas.

WOKING AND GUILDFORD WATER ARBITRATION.

The proceedings in this arbitration (see *ante*, pp. 485 and 635) were resumed and concluded on Monday of last week.

After a consultation between Counsel at the outset, it was agreed that £858 should be taken as the ascertained maintainable income of the Company in 1905 respecting the separated area—the difference between one-tenth and one-ninth of the working expenses.

Mr. Honoratus Lloyd, on behalf of the Corporation, urged that the question was whether there should be a deduction by reason of the fact that the Corporation did not take the whole undertaking within the severed area. If they had purchased the whole of the undertaking within the area, then they would have had to pay for the whole. But in this case, the Corporation were only entitled, according to the Act, to take so much as was not requisite for the carrying on by the undertaking of the other portions of the district. Therefore, wells, works, water, &c., still remained to the Company; and he contended that, under these circumstances, the Corporation were entitled to a deduction in the amount of compensation which they should pay upon the undertaking within the severed area, to the extent of the works which went to earn the profit, but which the Corporation were not allowed to take over. He was prepared to admit that there might be some payment due to the Company with regard to any excess of works which they might leave to them and which might be an incubus on the Company. With regard to the purchase of the undertaking, which the claimants put at the rate of 30·77 years, and which the Corporation were prepared to admit at 30 years, the question at issue between them was the principle as to the number of years it would continue. It was admitted on both sides that it could not go on after the expenditure of existing capital. The Company had expended their capital—leaving £77,479 remaining for the purposes of their future undertakings. They now said that this would be sufficient to carry them on to the year 1924; but he argued that his witnesses had shown that, owing to the increase in the district, they would be compelled to add a new engine and machinery at Chertsey. This, together with other expenses that would of necessity follow, would result in the whole of their capital being expended by 1916. Therefore, the Company could not claim on increased profits after that period. Counsel went on to deal with the works necessary to meet the supply of water at certain hours of the day above the maximum supply, and said this would inevitably necessitate the works mentioned.

Mr. Balfour Browne, for the Company, said that what the Corporation were purchasing in this instance, according to the Act, was so much—in fact, the whole of the undertaking in the severed area with the exception of that which was required for supplying the outside district. The Company had already expended the capital necessary to earn them the £1542 profit per annum out of the severed area. Therefore they were fully entitled to compensation in every respect. No deduction was consequently possible. With regard to the statement that the Company could not go on with the present capital after 1916, his witnesses had shown that, with the supply they had at Chertsey, the possibilities of making a reservoir at Chobham Ridges, and the supply from their other wells, they had ample to meet the requirements up to 1917 without any further expenditure of a large amount; and the money still remaining to them would carry them on adequately until 1924.

This concluded the proceedings; the Arbitrator reserving his award.

WATER PURCHASE QUESTION AT STOWMARKET.

Local Government Board Inquiry.

An inquiry was held last Wednesday by Mr. R. H. Bicknell, on behalf of the Local Government Board, into an application by the Stowmarket Urban District Council, under the Stowmarket Water Order of 1887, regarding the purchase of the local water undertaking, and the borrowing of £10,000 for the purpose.

The Clerk to the Council (Mr. P. C. G. Hayward), who explained the position of affairs, said that, previous to 1887, Sir E. Walter Greene and Mr. E. W. Lake were owners of property known as the Stowmarket Brewery; and upon the property was a well. A deputation from the old Stowmarket Local Board waited upon these gentlemen, who, after considerable pressure, consented to supply the town with water. The well was deepened, and the necessary machinery, reservoirs, &c., constructed; and the town was supplied with water. In 1905, the Urban Council took into consideration the questions of the supply of water and of the purchase of the water-works. Expert evidence was obtained as to the condition of the water, engines, reservoir, mains, &c.; and the Council considered they might safely negotiate with the vendors for the purchase. Representations had been made to the Council regarding certain discoloration of the water; and the Council felt bound to acquaint the vendors of the fact. The vendors, being perfectly satisfied that the water was thoroughly good, contended they had done all they should, and practically said: "If you want anything else, perhaps you will take the supply over yourself." The vendors were gentlemen living away from the place; and the Council believed they could look after the works and superintend them in a more efficient manner. The town was under great obligation to the gentlemen for coming forward in the public-spirited way they did in 1887. A letter had been received from the Clerk to the East Stow Rural District Council, stating that that body would raise no objection to the purchase, provided there was no variance from the original terms communicated.

Evidence was given by Mr. Henry Miller, M.Inst.C.E., Surveyor to the East Suffolk County Council, who stated that, from the reports of experts employed, he had advised the Council that they might safely purchase for £9500. He did not arrive at this figure by the usual method of valuation—the price would then have been much more. The Inspector remarked that he had seen the machinery, and was satisfied that it was in excellent order. Mr. G. R. Strachan, M.Inst.C.E., said he advised the vendors; and he told them that if they went to arbitration they ought to ask £15,000. When they agreed to sell for £9500, he declined to be a

party to offering the concern on a commercial basis at such a price. He had no doubt that the Council would make a profit of £500 a year, which meant that they would take over the concern without it adding one penny to the rates. As to dirty water, he did not doubt that at times unsatisfactory samples could be taken from taps where washouts had not been properly attended to. When additional washouts were put in and systematically flushed, the water would be all that could be desired. The vendors were not anxious to get rid of the works; but they had all along held that the proper authority for dealing with the water supply was the town itself. Mr. I. L. Ensor, chartered accountant, said the gross receipts from the water-works had been: In 1903, £819; 1904, £842; 1905, £866; and 1906, £895. The connections to the mains had been steadily increasing each year; and there was a probability of further increase. Mr. A. Warner, an engineer, spoke as to the good condition of the engines; and Mr. W. Lincolne Sutton, Public Analyst for East and West Suffolk, said the only place where good water was to be obtained in Suffolk was where there was chalk. Stowmarket was in a district where chalk was overlaid by a thickness of clay. He found samples of the water of the highest organic purity, free from pollution, and fit for dietary purposes.

Mr. F. C. Peacock produced samples of water which he said came from consumers' taps, and which "varied in colour from a dark brown to a lightish yellow." He, however, stated that he was not there to oppose the application, but to elicit such facts as would enable the ratepayers to arrive at a proper conclusion, which they had not been able to obtain before. Would the ratepayers get a better supply of water without costing more money when the undertaking was purchased? Would the consumers have to pay more for their water, or the ratepayers have to put their hands in the public purse to make up any deficiency? The present vendors obtained a monopoly under a Provisional Order, and undertook certain liabilities. They were obliged to supply water in a reasonably pure condition; and he submitted that the proper course to take was not to buy the works, but to call upon the undertakers to remedy the obvious defects. The purchase would more than double the present liabilities of the town. Whether they would get value for it was extremely problematical; and he submitted that the undertaking was not one the town should be called upon to acquire. Their rates a year ago were 9s. 2d. in the pound; but of this 6d. had been taken off. A question of such magnitude should be submitted to the ratepayers in the form of a referendum. Mr. Gostling, a chemist, Mr. Cuthbert, and Mr. Dupont also submitted samples which they maintained were unsatisfactory.

Before the inquiry closed, Mr. E. W. Lake, one of the vendors, said they were not anxious sellers at all. He felt strongly that the water supply should be in the hands of the town; and he told the deputation of the Local Board so in 1886. It might seem, because they were taking a much smaller price than was recommended by Mr. Strachan, that they were selling something that was worthless; but he always had taken the position that, as long as they could get the money back they had spent, they did not want a single penny profit. It was a remarkable thing, if the water was as bad as some tried to make out, that the undertaking was steadily progressing, and that during the last twelve months the number of consumers had so increased that a half-year's balance-sheet showed an increased revenue of £50.

Gas-Works Overdraft at Chorley.

Some outspoken remarks were made by Mr. H. R. Hooper, of the Local Government Board, a few days ago, when he was holding an inquiry in respect of an application by the Chorley Town Council for sanction to borrow £27,000 on account of money already spent in connection with the gas-works and overdraft to the Treasurer, and for supplying the township of Coppull with gas. It was explained by the Town Clerk (Mr. J. Mills) that the expenditure had been going on since 1875, until a sinking fund was established about four years ago. The Inspector pointed out that they had been for years expending capital without providing a sinking fund. The Corporation had no statutory powers to do so; and it was not done on business-like lines. If they borrowed money, they should pay it back. Their undertaking was standing on what he might term a false bottom. Here was a matter of £16,000 expended since 1875; and until the last few years there was no sinking fund. They had been going on for 22 years neither in a business way nor provided with statutory powers. In 1906, there was an overdraft of £16,670. The undertaking had been running on a false balance-sheet for years; and now they had come to a settling day. This could not be done without incurring some hardship in consequence of maladministration.

Gas and Electricity at Leicester.

At last Tuesday's meeting of the Leicester Town Council, the adoption of the Gas and Electricity Committee's report was moved by Mr. Jennings. After explaining in detail the gas accounts for the past half year, he said there was a profit on gas for the six months of £19,007, which, added to the profit of the previous half year, made a total of £39,158. From this was deducted the £5000 which, according to the decision of the Council, had to be placed to the reserve fund, leaving £34,158 to be handed to the Finance Committee for the district fund. The outlook was not as rosy as they would like it to be, as coal was increasing in price. They were well provided for the first half of the year; but no doubt they would have to pay an increased price during the succeeding half. However, the Chairman of the Committee had promised the Finance Committee £30,000 for the coming year. The staff was working together loyally, with a surprisingly small amount of friction, considering the size of the undertaking; and under these circumstances, he had good hopes they would be able to fulfil that promise. Speaking of the electricity accounts, he said that, though they had not a disposable profit on this undertaking, he believed the Council had been wise in not allowing a rival to come into the field. They were also acting wisely in using the profits in reducing capital. They had up to date paid £27,000 out of revenue in providing permanent works, &c.; and in good time they could hope that the undertaking would be of great advantage to the ratepayers. The report was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I understand that Mr. W. Gordon, the Gas-Meter Inspector to the Corporation of Edinburgh, takes exception to some remarks of mine regarding his recommendations as to proposed changes in the regulations for the testing of meters. When I referred to the possibility of meter manufacturers being harassed if a range of pressure were introduced, the remark had no reference to the Official Inspector, but to the suppliers of gas. If the public were to come to the knowledge that meters could be procured of different pressures, there would be demands for meters working at particular pressures, and gas suppliers would pass on to meter manufacturers the unrest among gas consumers. By all means, if there be any difficulty in getting meters to work at ½-inch pressure, let the requisite pressure be raised; but have a uniform pressure, and not a range, and let the pressure be the same for both old and new meters. To make a distinction between old and new would be to open up a wide field for complaint by, and trouble with, gas consumers. The difficulty in raising the standard of pressure lies in the fact that local Acts of Parliament give a minimum of 6·10ths; and if meters could be tested at 1 inch, either every local Act of Parliament would require to be amended (in which case would the expense be warranted by any gain to be derived?) or there would be an anomaly in the provisions for protecting the public in the matter of gas supply. Mr. Gordon explains that his recommendation regarding the rejection of meters which cause unsteadiness of light, or jumping, referred only to old meters; and he submits that such meters are taken to the workshops for repair, and another meter placed, without charge to the consumer. Quite so. But give the power to reject a meter for unsteadiness, and assume an irascible gas consumer who cannot get a steady light, would not such a one be apt to demand an official test? and if he were found to be wrong, he would have to pay for the test. There would certainly be an increase in the number of meters tested for certificate if this power were given; and looking at the matter from the point of view of the general public, I would require more reasons than I can, as yet, find, for giving this power. It is not in the interest of anyone to supply a bad meter. It may be that I am not fully informed upon the subject; but I cannot imagine that at present gas consumers have much to complain of in the matter of jumping lights caused by defective meters. What I wrote last week was not intended to reflect in any way upon the Meter Inspector; the idea underlying it was to endeavour to secure that, if changes are to be made, they shall be made after full consideration by all the parties interested, so that the new regulations may be the most equitable, reasonable, and workable which can be devised. My fear is that to allow a range of pressures would be to introduce complications which would likely be troublesome in working.

The Scottish Juniors—Western District—were last Saturday entertained to a lecture by Professor T. Gray, of the Glasgow and West of Scotland Technical College, on "Flame Temperature." The Professor is a young man, who holds the Chair of Technical Chemistry in the College. The meeting was held in his own class-room, in which there is a bust of Dr. Young, the originator of the process of distilling oil from minerals in Scotland, and, in his lifetime, the head of Young's Paraffin Light and Mineral Oil Company, Limited. Below the bust is an inscription intimating that it was Dr. Young who endowed the Chair. Gas and oil were thus again brought into immediate contact. Professor Gray has on the walls of his class-room a number of diagrams, for the use of his class, illustrating the weight and other characteristics of various gases; and on the desk a calorimeter which bears every sign of frequent use. It is quite evident, from these preparations, that he is accustomed to dealing with the properties of gases. His lecture showed him to be quite an adept in discussing them. It was a very profound production, dealing with quantities expressed in chemical formulæ and in the measures of the metric system. Had he not spoken with extreme plainness of language—a characteristic which was commented upon in the remarks of the members—it is doubtful if much would have been learned from it. But, treating the subject as he did, there was much in his lecture that will be useful, especially now-a-days, when, as Mr. O'Connor observed, there is so much interest being taken in the temperature of the gas-flame. This was the last meeting of the District for the session, apart from a couple of visits which have yet to take place—one next Saturday, to the Philpstoun Oil-Works of Messrs. James Ross and Co. at Linlithgow—and the members are to be congratulated upon the very excellent work they have done during the past winter.

In a report recently submitted by Mr. W. B. M'Lusky, the Gas Engineer and Manager, to the Corporation of Perth, he recommended the erection of four new purifiers in the gas-works, at a cost of £2670, which would include the cost of excavations and foundations and the raising of a boundary wall, but not the roof, which would cost £1100 more. The maximum daily demand for gas during the past winter reached 1,050,000 cubic feet; whereas the normal capacity of the purifiers was only 625,000 cubic feet. The proposed extension would bring the purifying capacity of the works up to from 1,375,000 cubic feet to 1,718,000 cubic feet per day, and would provide a reserve of from 31 to 64 per cent. With the approval of the Gas Committee, tenders for the work were taken; and Mr. M'Lusky recommended that that of Messrs. Henry Balfour and Co., Limited, of Leven, Fife, be accepted. The Council agreed to the erection of the purifiers.

The Lanark Town Council had before them on Monday two items relating to the gas supply to the town. The first, in point of time, was a minute by a Sub-Committee relative to a proposal to charge the Lanark Gas Consumers Company, Limited, wayleave for their pipes in the streets. Mr. Paton said that while they were told that they had power to charge such wayleave, he was not convinced that it would be judicious to do so, because, though the Company had refused to consider an offer which a Committee of the Council were prepared to recommend that they should make, he thought that, if they charged wayleave, it would appear to the public that they were simply taking revenge upon the Company. He thought it would be far better if they could get a further concession in the price of gas for lighting their

streets. Mr. Macleay pointed out that the minute did not state what arrangement they proposed with the Gas Company. He appealed to them to leave the matter with the Committee; and he had no doubt they would be able to report something which would meet with the approval of the Council when the time came. This was agreed to. Later, a letter from the Secretary to the Gas Company was read, stating that the Directors had had a letter from the Council before them, and that it was not the case that the request of the Council's Committee to be informed of the basis upon which Mr. Gibb's valuation of the Company's undertaking proceeded had been refused; but that the Committee were informed that the basis of the valuation was the amount of the profits, whereas the valuation of the Council's valuer was made upon the amount of the dividends paid. Consequently, the Council had all the information before them which was necessary to enable them to make an offer. The letter proceeded to state that as the Council intimated that in the meantime all negotiations were broken off, the writer was instructed to ask if the Council were to make an offer for the gas-works, and say that they must know this as early as possible, to enable them to decide what was to be done about new works. Mr. Graham thought that if the present opportunity were let slip, they would not have such a chance again probably for many years. He moved that the Committee again take up the matter, and see if some basis of negotiation could not be got in regard to price, which would ultimately lead to a successful issue. Mr. Macleay did not think the motion was in order. If they referred to the resolution adopted at the last meeting (held in private), they would see that it stopped the matter; and this resolution was unanimously passed. Mr. Forrest considered that when they had a letter from the Company saying they were prepared to treat with the Council, there would be nothing wrong in opening up the matter again. He had it from a Director that there might be some chance of coming to an agreement, and that the Directors were quite prepared to alter their valuation. It was easy to go back upon the minute of the last meeting, in face of that letter. Mr. Macleay reminded the Council that if they made an offer they would be committed to go to arbitration. He moved that the Council adhere to their former resolution. On a division, eight voted for the subject of the transfer being reopened, and six against. The matter was left in the hands of the former Committee. It will be remembered that about six months ago Mr. W. R. Herring valued the undertaking of the Company, apart from stocks, book debts, &c., at £6691. The capital of the Company is returned at £6000; and the dividend paid is at the rate of 7½ per cent.

The Dunfermline Gas Committee, at a recent meeting, agreed to accept an offer by the Lochgelly Iron and Coal Company, Limited, to supply 4000 tons of double washed nuts, at 10s. 4d. per ton, delivered at the works, as required, up to July next; and also an offer by Mr. Thomson Smith, of the Kingseat Company, to supply 1000 tons of mixed treble and double nuts at 10s. per ton, delivered at the works next month. This arrangement was ratified by the Town Council.

The Dumfries Town Council last week considered a report by the Manager—Mr. G. Malam—with reference to the erection of sulphate plant in the gas-works, and an estimate by him as to the profit to be derived from the working of such plant. It was agreed, on the motion of Provost Glover, the Convener of the Gas Committee, that suitable plant be procured as soon as possible, and that a deputation be sent to Glasgow and neighbouring towns to inspect works there.

The Cowdenbeath Gas Company have added to their works a sulphate plant, which has been erected by the Chemical Engineering Company, Limited, of London. They are about to erect a large new gasholder and hydraulic plant for the handling of coal and coke. These works will be carried out under the supervision of the Company's Manager, Mr. J. B. Scott, who is also Engineer for the work.

The Lochgelly Gas Company have resolved to make considerable alterations upon their works, according to plans which have been prepared by Mr. J. D. Keillor, their Manager. The proposal recently made that the Town Council should acquire the Gas Company's undertaking has been adversely reported upon by a Committee of the Council, who consider that the transfer would not be beneficial to the ratepayers. The cost was estimated at a minimum of £15,000.

After having been free for a long time from occurrences of the kind, Edinburgh was the scene, on the forenoon of Monday last, of a series of explosions in an electric culvert. These took place in the Canongate. Six manhole covers were forced up. Two of them were thrown into the air a great height, and on falling were broken to splinters. The covers are slabs of concrete, cased with iron, and are of great weight. Though there were many people in the street, no one was injured.

Metropolitan Water Board.—The usual fortnightly meeting of the Board was held on Friday—Sir Melvill Beachcroft presing. The Law and Parliamentary Committee reported that 51 petitions had been deposited against the Board's Charges Bill. They added that the Board might be approached by the opponents, both before and during the consideration of the Bill by Parliament, with a view to negotiating for alterations and amendments with regard thereto; and many matters would no doubt arise which would demand immediate settlement. The Committee therefore recommended that the Board should delegate to the Law and Parliamentary Committee, with power to act, authority to negotiate with the opponents and petitioners, and to agree to such alterations and amendments in the Bill as might be considered to be in the interest of the Board, and to determine any questions that might arise during the passing of the Bill through the Committee stage. Mr. Lidiard proposed that the Chairman of the Appeal and Assessment Committee, the Works and Stores Committee, the General Purposes Committee, and the Finance Committee should be added to the Law and Parliamentary Committee for the purpose in question. The recommendation was adopted, with the addition of this proposal. It was subsequently agreed that it should be referred to the Finance Committee to report fully at an early date as to the advisability of employing chartered accountants in connection with the audit of the accounts of the Board and the allocation of expenditure between capital and revenue, and also as to the cost thereof.

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CURRENT SALES OF GAS PRODUCTS.

Week ending March 16.

The London market for tar products remains very steady, but without much business to report; makers being so well sold for some months to come. Pitch continues to strengthen in value. It is reported from Belgium that the experimental use of small coal in lieu of briquettes has not proved satisfactory. Benzol, 90 per cent., is quoted about 11d. net; while 90 per cent. toluol is worth 1s. 2½d. Ordinary London creosote for early delivery has been done at 2⅜d. to 2½d. net in bulk and 12s. 4½d. in barrel. The demand for this article is extremely good, and the outlook very encouraging from a manufacturer's point of view. Sulphate of ammonia is still in a dull condition; the present price being about £12 per ton on Beckton terms.

LIVERPOOL, *March* 16.

Sulphate of Ammonia.

Prices have again been somewhat irregular, but on the whole the market is a shade easier. Available supplies are in moderate compass; but new business has been scarce, and has been rendered more difficult by speculative offering abroad at a discount on spot prices. The closing quotations are £11 16s. 3d. per ton f.o.b. Hull, £11 17s. 6d. to £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. So far, home demand has been only moderate. There is not in any quarter much keenness to operate in the forward position, although buyers have been feeling their way by making inquiries. The large makers in London and Scotland are fairly well sold up to June, and are not disposed to meet the views of buyers. Smaller makes have, however, been sold at a shade under £12 per ton f.o.b. for April-June delivery.

Nitrate of Soda.

There has been a fair amount of business for prompt delivery; and sellers are firm at 11s. 6d. per cwt. for 95 per cent., and 12s. for refined quality.

LONDON, *March* 16.

Tar Products.

There has been no material alteration in the market during the past week. Pitch remains practically unchanged; but there appears to be rather more willingness on the part of manufacturers to sell at current prices whatever quantity they may have available this side of June. Best quality has again been sold on the east coast at 25s. to 25s. 6d. In London, makers seem to be quite easy, and it is improbable that anything could be obtained at under 26s. to 26s. 6d., though if they were anxious to sell they could not realize these figures. On the west coast, business is still possible at 24s. at outside ports, though rather higher figures would probably be demanded at Manchester and Liverpool. Creosote is very firm. London makers will not quote, except at very high figures; while in the Midlands and the North distillers appear disinclined to name a price, and are quite prepared to wait before placing any further quantity, as they are already fairly well sold. Benzol, 90 per cent., is very quiet; business having again been done, both for prompt and forward delivery, at 10d. on the east coast and 11d. in London. Fifty-ninety per cent. is scarce, and there is not much demand, prices remaining unchanged. Solvent naphtha is quiet except for London makes, for which there is a fair demand; supplies being rather difficult to obtain, as makers are well sold. Carbolic acid is very quiet; and Continental consumers refuse to offer more than 1s. 8½d. on the east coast. Crystals appear rather stronger, and a firm offer at something under current prices would no doubt receive consideration. There is really nothing doing in toluol, and the position remains unchanged. The same remark applies to anthracene, in which no sales are reported.

The average values during the week were: Tar, 13s. 6d. to 17s. 6d. Pitch, London, 26s. to 26s. 6d.; east coast, 25s. to 25s. 6d.; west coast, 24s. to 24s. 6d. Benzol, 90 per cent., 10d. to 10¾d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2½d. Crude naphtha, 4¾d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2¼d. to 2⅜d.; North, 2d. to 2⅛d. Heavy oils, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., 1s. 8¼d. to 1s. 8½d. Naphthalene, £4 to £8 10s.; salts, 37s. 6d. to 40s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

This article has been quiet during the past week, and prices have been inclined to droop. The principal London makers, being well sold, are firm in their ideas, and refuse to quote anything under £12 2s. 6d. on Beckton terms; but other makers have been sold for prompt delivery at considerably under this figure. In Leith, makers are very well sold; but business is reported for prompt delivery at £12. In Hull, best makes have been sold at £11 18s. 9d.; and it is reported that £11 16s. 3d. was accepted for some quantity. In Liverpool, the market is quiet, and prices range from £11 17s. 6d. to £12.

Oldham Gas Engineer's Salary.—Alderman Hanson, the Chairman of the Oldham Gas Committee, in moving that the salary of Mr. Tim. Duxbury, the Gas Engineer, be increased from £400 to £500 per annum, and that the maximum be fixed at £600, explained that the previous month the recommendation of the Committee was sent back in order that the maximum salary might be fixed. Mr. Simister contended that the resolution was misleading, and should have read "from £400 a year and emoluments;" but Alderman Hanson replied that the house occupied by Mr. Duxbury, and what Mr. Simister called "emoluments," were valued at £50. Alderman Johnson moved as an amendment that the salary of Mr. Duxbury be advanced from £400 to £500 by annual increments of £25, and that this be the maximum salary, with house, coal, gas, and rates free. This, he said, was the maximum salary of Mr. Chadwick, Mr. Duxbury's predecessor, who had been with the Corporation practically all his life. Mr. Simister seconded the amendment, which was carried.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

With the exception of house fuel—for which there has been a lessened request, but no reduction in prices—the demand for coal of all other descriptions continues strong, and is only met with difficulty. Contractors for steam coal, gas coal, and cannel have to pay increased rates compared with last year's contracts. In gas coal, prices have gone up fully 3s. per ton. Cannel is also from 2s. 6d. to 3s. per ton more. One local colliery, on the outskirts of Manchester, accepted a tender for gas coal last week, amounting to 2000 tons, at the increased price. In the Barnsley district of Yorkshire, the output is being almost wholly absorbed by railway and other contracts at from 8s. 6d. to 9s. 6d. per ton. In the open market, the price for coal has ranged at from 11s. 6d. to 12s. per ton. There has also been an extra demand to cover the Easter Holidays. For steam coal, colliery proprietors have agreed not to quote less than 12s. per ton for the best quality before the end of June. Quotations for coal at the Lancashire pits are as follows: Best house coal 14s. 6d. to 15s. 6d., secondary 13s. 6d. to 14s. 6d., common 10s. 6d. to 12s. 6d., burgy 8s. 10d. to 9s. 6d., best slack 8s. to 9s., lower and medium qualities 6s. 9d. to 8s., coal for bunkering 12s. to 13s. f.o.b. at Garston.

Northern Coal Trade.

There is an improvement in the coal trade—due in part to the preparation for the coming holidays, and to the slow increase of the exports that is usual about this time of the year. In the steam coal trade, the values are firmer, and for best Northumbrian steams about 15s. per ton f.o.b. is the current quotation; while for second-class descriptions, from 13s. is quoted. Steam smalls are steady at about 8s. 6d. per ton. The collieries seem to be working fully; and the output is well taken up generally, with exceptions through delay of steamers to load. The gas coal trade is still active, though the deliveries on the large home contracts are now lower, and must be expected to fall further with the lengthening days. Durham gas coals vary, according to quality, from about 12s. to 13s. 3d. per ton f.o.b. As to the contracts, it appears now to be the belief in Durham that some of these for the great London Gas Companies are being placed with Yorkshire collieries, and that to a considerable extent, but there are no details given as to the prices. As yet, the Durham collieries seem to adhere substantially to the current prices. Coke is fairly steady; and the demand before the holidays may stiffen it. Gas coke is from 13s. 6d. to 14s. 6d. per ton f.o.b.

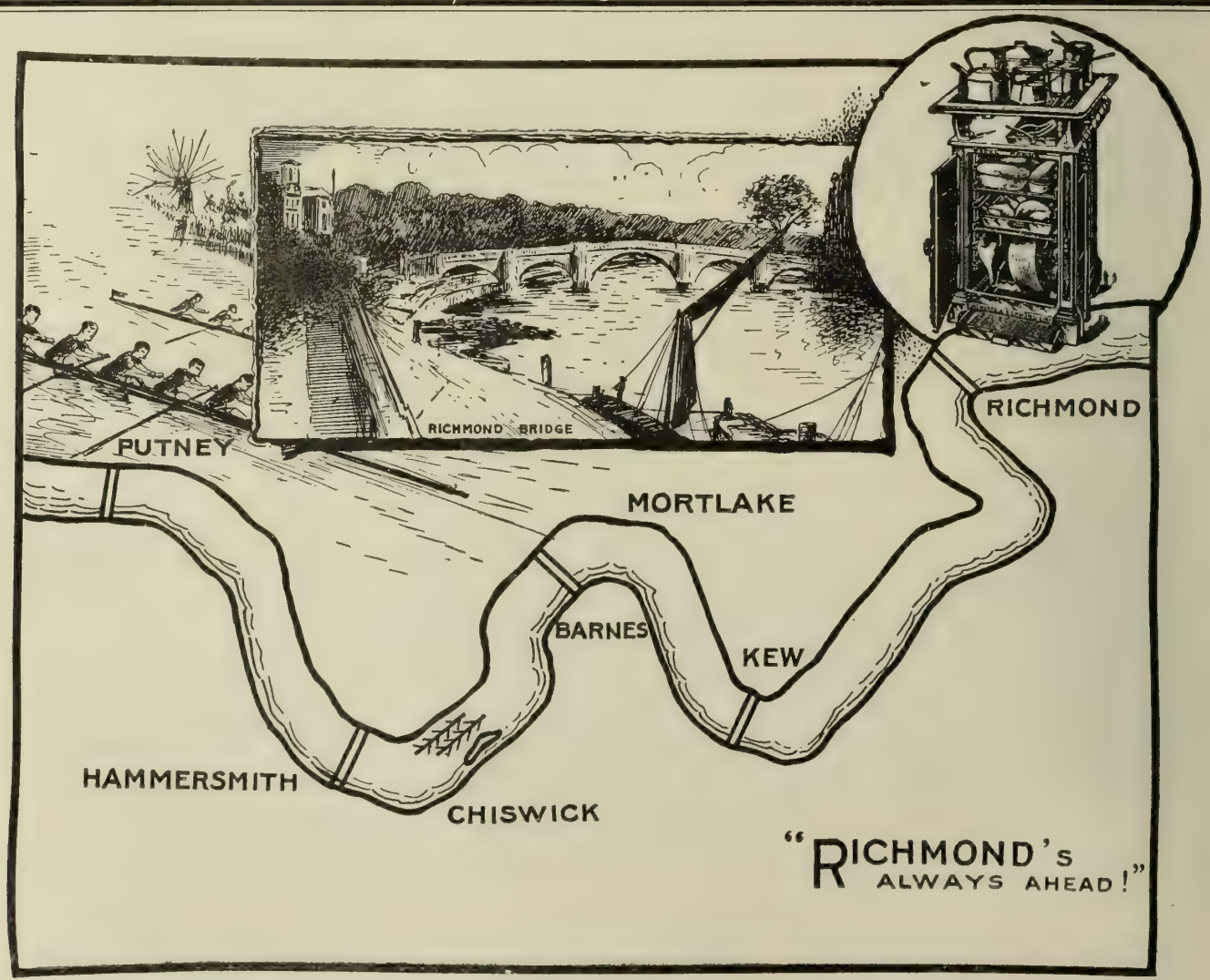
Scotch Coal Trade.

Trade has been a little quieter; ell, for one thing, having been somewhat more plentiful, which is, however, looked upon as only a passing incident. Prices show no indication of slackening. These are quoted as: Ell 12s. 3d. to 13s. 6d. per ton f.o.b. Glasgow, splint 13s. to 13s. 3d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 263,873 tons—a decrease of 27,822 tons upon the preceding week, but an increase of 32,631 tons upon the same week of last year. For the year to date, the total shipments have been 2,351,517 tons—an increase of 144,899 tons upon the corresponding period of 1906.

San Paulo Gas Company, Limited.

In the report which will be submitted at the annual meeting of the Company next Tuesday, the Directors state that the revenue account shows a profit on the past year's working to Dec. 31 of £28,792, to which has to be added the balance of £3670 brought forward from 1905, making a total of £32,462. After deducting interest on debentures, interest on bank loan, provision for debenture redemption, and depreciation on investments, there is a disposable balance of £27,100. An interim dividend of 3 per cent. (absorbing £7500) was paid in September; and the Directors, after transferring £3000 to reserve account, recommend the payment of a final dividend of 5 per cent., free of income-tax, which will absorb £12,500—making a distribution of 8 per cent. for the year, and leaving a sum of £4100 to be carried forward. The average rate of exchange for the year was 16·231d., as compared with 15·718d. in 1905. The revenue has all been converted into sterling at 16¼d. per milreis. The assets and liabilities of the Company in Brazil on Dec. 31 have been valued at 15½d., as against 16¾d. at the end of 1905. The decrease in the value of the assets resulting from the lower rate of exchange amounts to £1674 5s. 6d., which sum has been charged to exchange account. The consumption of gas by private residents continues to increase, particularly for cooking purposes. The development of the Company's business has necessitated further extensions of the manufacturing and distributing plant. To meet the expenditure incurred thereby, the remaining £55,000 of debentures were successfully issued in October, almost exclusively to the shareholders. The whole of the debentures authorized are now issued.

Barrow Water Supply.—The Corporation of Barrow hope that before the end of the present year the works they are carrying out for taking water from the River Duddon will have been completed. The scheme is an interesting one, inasmuch as, instead of impounding the water in a large reservoir in the Duddon Valley, the supply is taken directly from the bed of the river, and is then conveyed in 10-inch pipes to a high-service reservoir at Barrow. The Corporation have undertaken the work of increasing the storage capacity of Seathwaite Tarn, with the view of using the water to compensate in dry seasons for the supply drawn off for Barrow. This tarn is 1000 feet above the level of the valley. The undertaking will cost upwards of £150,000; and the contract is in the hands of Kennedy Bros., of Glasgow.



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Water Supply of Tynemouth.

It has recently been rumoured that the Newcastle and Gateshead Water Company are desirous of taking over the Tynemouth water undertaking; and a "Newcastle Chronicle" correspondent reports that unofficial communications have passed between two members of the Tynemouth Town Council and the Secretary of the Newcastle Company. Interrogated on the subject, the councillors explained that they did not intend that their visit should be regarded as that of representatives of the Tynemouth Corporation, but as that of individual ratepayers; while the Secretary of the Company replied that the matter had never been considered by his Board as a Board, though privately it had been freely enough discussed by members of the Company, and had even been discussed in committee meetings of the City Council. The Secretary was then asked whether the Company would be prepared to take over the Tynemouth water undertaking; and it was pointed out to him that the Company would have to go to Parliament for an additional source of supply in 1916, or perhaps sooner, owing to the heavy and increasing demands of the Blyth district. To get this additional supply of water, the Company would have to go to the Coquet; and to get to the Coquet, they would have to fight Tynemouth. If the Company had Tynemouth's watershed at the Font in their possession, not only would they have got Tynemouth out of the way, but they would have the whole of East Northumberland as prospective customers, and would secure the Coquet without fighting the Corporation. The Secretary replied that this was exactly the position; and if the Company could buy the Corporation out on anything like decent terms, it would pay both sides. The two councillors next reminded the Secretary that in 1897 the Company offered to supply Tynemouth at 4½d. per 1000 gallons; and they said they were anxious to know whether the Company would now be prepared to take over the whole of the liabilities of the Tynemouth water undertaking up to date, and supply Tynemouth with water at 4½d. per 1000 gallons in perpetuity. The Secretary answered that this was a matter to which he could not personally commit his Directors; but he intimated that it was in every way likely that they would give terms on this basis. The result of these inquiries has been laid before the Parliamentary Committee of the Tynemouth Town Council; and they have declined to deviate from the course which has been adopted with regard to their new Bill.

Reduction in Price at Wrexham.—The report adopted at the annual meeting of the Wrexham Gas Company stated that the Directors proposed to reduce the price of gas by 3d. per 1000 cubic feet, to take effect in the September quarter. This would make the net charge 2s. 3d. for lighting, and 2s. for cooking. At a subsequent extraordinary meeting, it was resolved that the capital of the Company be increased by the sum of £15,000 of ordinary stock.

Suicide by Gas at Cambridge.—A Cambridge tailor and robemaker, named Benton, who had been strange of late, and missing from home for some time, was last Tuesday found by some friends dead in his house (which had been shut up owing to his previous absence). The place was full of gas, and the bath-room door was fastened. An entry was forced, and deceased was discovered inside. He had stuffed up the window and pulled down the gas-bracket, with the result that he was suffocated.

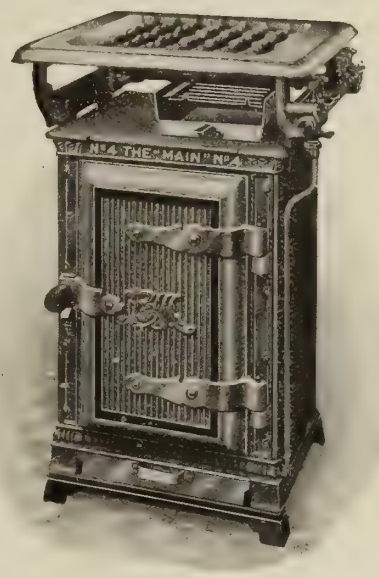
Fatal Gas Explosion at Newcastle.—An inquest was held at Newcastle the week before last, on the body of a man named Purves, who, the Jury found, died from the effects of injuries accidentally received through an explosion of gas in the basement of premises of which he was a caretaker, though as to how the explosion occurred there was no evidence to show. The evidence went to show that on the night of the explosion there was a strong smell of gas in the basement of the building. A search by the deceased man and the resident caretaker, failed to detect any escape. The presence of gas had been detected on previous occasions; but not to the same extent as on the day of the explosion. No matches were employed in the search. Expressions of sympathy with the relatives of the deceased were made on behalf of his employers and the Gas Company.

Quality of Gas at Leigh-on-Sea.—The familiar cry of "Poor gas" has been raised by members of the Leigh-on-Sea Ratepayers' Association—accompanied by the time-honoured joke about having to supplement the light with candles; but it seems that the Council are fully alive to whatever shortcomings there may be. In reply to the malcontents, Mr. Durrant, who explained that he had been Chairman of the Gas Committee for three years, said that during this time only one complaint had been brought officially to his notice. The Council proposed to substitute a 6-inch main for the 3-inch one in the Broadway, as the Gas Department was increasing to such an extent that the mains were not deemed large enough. They were now taking a forward step, with due regard to economy. An expert was to be called in to report upon, among other matters, the advisability of improving the condition of the purifiers and of increasing the present storage capacity.

Seaford Gas Company's Order Dropped.—The Parliamentary Agents of the Seaford Gas Company, Messrs. Sherwood and Co., have written to the Parliamentary Agents of the Urban District Council announcing that the Company have given very careful consideration to the objections to the Seaford Gas Order lodged on behalf of the Council, and the suggested amendments. It appears, they say, both from the objections and the proposed amendments, that the views of the Council and of the Company are so very divergent that there is no prospect of an agreement being come to; and, while the Company consider that it is desirable that they should be given statutory powers, they apprehend that a discussion of the proposed amendments would lead to no useful or satisfactory result. Under these circumstances, the Company consider that they would not be justified in putting either their shareholders or the ratepayers to the expense of a contest; and they have decided not to proceed further with the Order. In advising the Council of this decision, their Agents point out that the withdrawal of the Order certainly makes it easier for the Council to get possession of the undertaking, if they desire to do so, by a Bill next year.

SEASON 1907.

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A New Holder at Milton-next-Sittingbourne.—A few days ago, Mr. J. Filmer, the Chairman of the Gas Committee, turned the gas into a new holder which has just been erected for the Milton Urban District Council. The need for increased storage accommodation has been caused by a rapid growth in the gas consumption during the past few years. The make was 12½ million cubic feet in 1902; whereas at the present time it is 18 million feet. The new holder has increased the storage capacity from 26,000 to 106,000 cubic feet. The opening ceremony was followed by light refreshments.

Penrith Gas Consumption and the Public Lamps.—The Manager of the Penrith Gas-Works (Mr. E. Shaul) has reported to the Urban District Council that the make of gas last year was nearly 55½ million cubic feet, which was a decrease of 1½ million cubic feet when compared with the previous twelve months. Some 185 tons less coal were carbonized; there having been a slight increase in the production of gas per ton. The falling off in the consumption was, he says, due to the system, introduced eighteen months ago, of extinguishing a large proportion of the pubic lamps at 11.30 p.m.—thus saving considerably over a million cubic feet of gas. Nearly 9 million cubic feet were accounted for by the slot-meters.

Ottoman Gas Company, Limited.—The report to be presented at the meeting of the Company next Tuesday states that the gas-rental for the half year to Dec. 31 amounted to £16,513, against £14,837 for the corresponding period of 1905; and the net profit is £3987, compared with £3904. The amount standing at the credit of the profit and loss account is £8833. The Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 7 per cent. per annum on the ordinary shares, tax free, leaving a balance of £6234 to be carried forward. Having regard to a report from the Company's Engineer in Smyrna, that a very considerable expenditure was necessary to provide for the increase in the Company's business, the Directors decided that the assistance of a Consulting Engineer was advisable; and they have pleasure in stating that they have secured the services of Mr. Arthur F. Phillips, M.Inst.C.E.

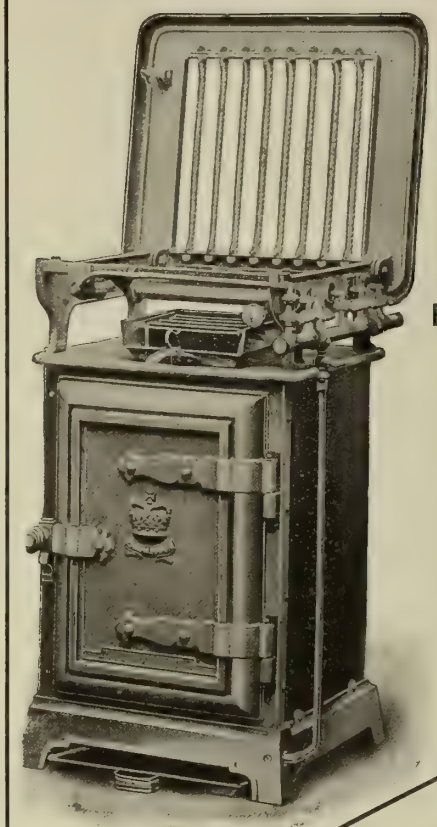
Treating the Pontypridd Water for Discoloration.—It may be remembered that in the summer of last year the discoloration of the Pontypridd water supply was increased by reason of the lowness of the water in the reservoir, and it was decided to try the result of the Candy automatic compressed air and oxidizing filters; it having been found that ordinary sand and gravel filters did not effect the required decolorization and reduction of the organic ammonia. A battery of four filters, therefore, was laid down by the firm, and we learn that the Pontypridd Water Company have ordered eight additional filters to be delivered as soon as possible, in order to be able to filter, on the Candy system, the whole of the supply from their new reservoir. The system first automatically compresses the atmospheric air into the water, saturating it with dissolved oxygen, and then the water passes through layers 5 feet in thickness, composed of specially selected, graded, and prepared sand, grit, and pebbles, together with the oxidizing and purifying material oxidium—a porous, rustless, and insoluble mineral substance possessing properties somewhat similar to those of spongy platinum.

Alleged Gas-Works Nuisance at Branksome.—A deputation waited upon the Poole Town Council at their last meeting regarding a nuisance of which Branksome residents have long complained, and which they contend emanates from the Bourne Valley works of the Bournemouth Gas and Water Company. The Rev. E. M. Scott, who acted as the spokesman, pointed out that, after seeking a remedy in all directions, a petition had been sent to the Local Government Board, who had sent down an inspector, whose report, he understood, was not yet to hand. He admitted that the great difficulty had been that no one would say absolutely that the nuisance was at the gas-works. The Mayor said the Council were very pleased to see the deputation. They knew something about a gas nuisance in Poole; but that was a little better now. Mr. James, on the other hand, said he was not at all convinced that the nuisance at Branksome was such a grave one as it was made out to be. He was the agent for property in the immediate vicinity of the gas-works; and he found that the houses were always occupied by first-class tenants. He characterized the matter as a "chestnut." The Council resolved, on the recommendation of the Sanitary Committee, to call the attention of the Company to the matter, and ask them to submit proposals for abating the nuisance.

Sale of Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold, by order of executors, £898 of consolidated ordinary stock of the Hampton Court Gas Company, ranking for a standard dividend of 5 per cent., but carrying 5¼ per cent., at from £113 to £115 per £100 of stock. He also sold, under similar circumstances, a small parcel of new ordinary stock of the Southend Gas Company, carrying 5¾ per cent. dividend, at £118, and some new ordinary "B" stock, carrying 5⅜ per cent., at £114; some £5 shares in the Chertsey Gas Company at £12 15s. to £13 apiece, some new "A" shares (30s.) at £4 each, a parcel of new "B" shares (50s.) at from £6 12s. 6d. to £6 15s. per share, and a few new "C" shares (£10) at from £26 10s. to £27 apiece—all the last four groups of shares being sold *cum div.* at the rate of 12 per cent. as from the 30th of September last. Some consolidated ordinary stock of the Lea Bridge District Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, but carrying 1 per cent. more, fetched from £121 to £123 per £100 of stock. On the same occasion, Mr. Richards offered a new issue of consolidated stock of the Uxbridge Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, and entitled, in view of the dividend last paid by the Company, to 4½ per cent. per annum; but as the biddings did not reach the parliamentary reserve, it was withdrawn.

By an explosion last Thursday at the works of a Belfast firm of gas-fitters and engineers, an employee named Leigh lost his life. He was engaged on an acetylene gas tank, which, however, was not at the time connected with a generator. Deceased was working alone when the accident happened, so that no one witnessed the occurrence.

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WRITE—

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BELL BARN ROAD, BIRMINGHAM.

The Lochgelly Gas Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, for three 14 feet square purifiers, complete with Weck's valve, and a steel roof over the purifiers, &c.; also for the removal and rearrangement of the existing apparatus. The whole work has to be carried out under the supervision of Mr. J. D. Keillor, the Company's Engineer.

Mr. F. H. Tulloch recently held a Local Government Board inquiry at Ollerton into the application of the Southwell Rural District Council for sanction to borrow £1250 for purposes of water supply for the Ollerton parish. It is proposed to take water from the Nottingham Corporation main, which passes through the village; and services will be laid to supply practically every house in the parish with water. Among those taking part in the inquiry were Mr. G. E. Kirkland, the Clerk to the Southwell Rural District Council, Mr. H. H. Sands, of Messrs. Sands and Walker, the Engineers to the scheme, and Mr. F. W. Davies, the City Water Engineer.

At the general meeting of Messrs. C. & W. Walker, Limited, to be held in Birmingham on the 20th inst., the Directors will report that the profit for the year ending Jan. 31 last, after charging Directors' fees and depreciation on buildings and plant, amounts to £5017. After adding the balance brought forward (less the sum voted to the Directors at the ordinary general meeting), £6502, and deducting the interim dividends paid in August last, there remains for disposal £8419, which the Directors recommend be appropriated as follows: Dividend at the rate of 5½ per cent. per annum on the preference shares for the six months ending Jan. 31, £1100; dividend at the rate of 10 per cent. per annum (free of income-tax) on the ordinary shares for a like period, £2000; to be carried forward, £5319.

A few weeks ago we noticed a pamphlet on Milbourne's patent luteless purifiers and valves which Messrs. C. & W. Walker, the sole makers of these appliances, were issuing. We have now received a *brochure*, got up in similar style, devoted to the various valves manufactured by the firm, the illustrations of which are accompanied by a few explanatory particulars. These valves are too well known to call for special mention. It is sufficient to say that they are shown very effectively.

Proposing the toast of "The City and Trade of Birmingham," at the annual dinner of the Birmingham district of the National Association of Master Plumbers, Mr. A. Woodfall referred to the question of municipal trading, and said that there was one branch with which he entirely disagreed—the gas-fitting department of the Corporation. It seemed altogether wrong that any body of ratepayers should subscribe rates, and so provide capital to be used against their own interests, and therefore have the bread taken from their mouths. Mr. E. Antony Lees, in responding, said that with municipal trading he had happily nothing to do except in a form which he thought was unanimously acknowledged as being best in the hands of the municipality. It was perfectly clear to everyone who considered the question, that such a matter as the water supply was best dealt with by the community as a whole. In 1876, the revenue of the Water Department was a little over £90,000; while during the last completed year it was £278,000. This, he thought, was an astounding result. In 1891, their turnover in the matter of the water supply was £135,000, showing an increase compared with 1876 of £45,000. In the first fifteen years there was an increase of 50 per cent.; but in the second period of fifteen years there was an increase of 100 per cent.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS AND WATER ENGINEER. Ramsgate Corporation. Applications by April 15.
ENGINEER-MANAGER. Guernsey Water Company. Applications by March 27.
SUPERINTENDENT OF SHOW-ROOMS (GAS AND WATER). No. 4742.
DRAUGHTSMAN. West's Gas Improvement Company.
OUTDOOR SUPERINTENDENT. Devonport Gas Department. Applications by March 22.
COAL REPRESENTATIVES. No. 4736.
MAIN AND SERVICE LAYER. Devonport Gas-Works.

Situations Wanted.

ASSISTANT-MANAGER OR DRAUGHTSMAN. No. 4731.
ENGINEER OR ASSISTANT. No. 4732.
INDEX READER AND OFFICE WORK. 74, East Dulwich Grove.
MANAGER OR OUTDOOR SUPERINTENDENT. No. 4743.
WORKING MANAGER OR FOREMAN. No. 4744.

Plant, &c., for Sale.

HYDRAULIC MAIN, &c. Reading Gas Company.
HYDRAULIC MAIN, CONDENSER, &c. Barrhead Gas-Works.
RETORT MOUTHPIECES, HYDRAULIC MAINS, PIPES, &c. Canterbury Gas and Water Company.

Plant (Second-Hand) Wanted.

AMMONIA STILL. No. 4745.

Company Meetings.

BRITISH GASLIGHT COMPANY. Offices, March 27. Twelve o'clock.
OTTOMAN GAS COMPANY. Offices. March 26. One o'clock.

Stocks and Shares.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY. March 27.
LEATHERHEAD WATER COMPANY. March 25.
NORTH MIDDLESEX GAS COMPANY. April 8.
REDHILL GAS COMPANY. April 9.
SOUTH ESSEX WATER COMPANY. April 9.
WEST HAM GAS COMPANY. April 9.

TENDERS FOR

Breeze.

ASHFORD (KENT) GAS DEPARTMENT. Tenders by March 27.

Fire-Clay Goods.

BANGOR (CO. DOWN) GAS DEPARTMENT. Tenders by April 3.
LOUGHBOROUGH GAS DEPARTMENT.

Lime.

ASHFORD (KENT) GAS DEPARTMENT. Tenders by March 27.

Oxide of Iron.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 25.

Reservoir (Covered).

ALDERSHOT GAS AND WATER COMPANY. Tenders by April 12.

Sulphate of Ammonia.

ASHFORD (KENT) GAS DEPARTMENT. Tenders by March 27.

Sulphuric Acid.

ASHFORD (KENT) GAS DEPARTMENT. Tenders by March 27.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by March 25.

Tar and Liquor.

HAWORTH URBAN DISTRICT COUNCIL. Tenders by March 22.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 738.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅜	..	5 1 10
50,000	10	Feb. 28	14	Bourne- mouth Gas and Water — 10 p.c. B 7 p.c. Pref. 6 p.c.	27—28	..	5 0 0
51,810	10	,,	7		16¾—17	..	4 2 4
53,200	10	,,	6		14½—15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	9½	Do. New	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122	..	4 2 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220—225*	+½	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk.	160—165*	+1	5 0 0
460,000	20	Sept. 27	10	British	42—43	..	4 13 0
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	118—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	89—93	..	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	Mch. 14	8½	Cagliari, Ltd.	23—25*	..	6 12 0
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9¾	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,443,280	Stk.	,,	5⅛	Commercial 4 p.c Stk.	107—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	105—108	..	4 12 7
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	121—124	—1	5 4 10
200,000	,,	,,	7	Do. 7 p c, Pref.	138—143	..	4 17 11
460,170	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103—105	..	3 16 2
486,090	10	Jan. 31	11	European, Ltd.	24—25	—½	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4⅛*	Gas-light and Coke — 4 p.c. Ord.	95—97	..	4 10 10
2,600,000	,,	,,	3½		87—89	..	3 18 8
3,799,735	,,	,,	4		106—108	..	3 14 1
4,193,975	,,	Dec. 13	3		83—85	—1	3 10 7
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95—100*	—½	5 0 0
82,500	,,	,,	6½	Do. do. 5 p.c.	116—119*	+1¼	5 9 3
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	178—181	—1	4 8 5
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Mch. 14	5	Lea Bridge Ord. 5 p.c.	117—122*	..	4 18 4
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 28	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. B	164—165	..	4 4 10
144,140	Stk.	Feb. 14	7⅛	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	01—103	..	4 7 5
541,920	20	Nov. 14	3⅛	Monte Video, Ltd.	11½—12½	..	5 12 0
1,775,892	Stk.	Feb. 28	4⅛	Newc'tle & G'tesh'd Con.	106—103	—1	4 5 8
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7¼—8¼	..	4 6 2
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Sept. 13	10	Sheffield A	248—250	..	4 0 0
209,984	,,	,,	10	Do. B	248—250	..	4 0 0
523,500	,,	,,	10	Do. C	248—250	..	4 0 0
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	120—123	—2½	4 9 5
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—86	..	3 9 9
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	154—156*	..	5 2 7
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c	120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Feb. 28	6½	Tottenham — A 5 p.c and B 3½ p.c.	123—126	..	5 3 2
398,940	,,	,,	5		101—103	..	4 17 1
137,500	,,	Dec. 28	4	Edmonton — 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	104—106	..	4 14 4
30,000	Stk.	Feb. 14	8	Wands- worth and Putney — A 5 p.c.	—	..	—
255,636	,,	,,	6⅝		135—140	—3	4 12 10
75,000	,,	,,	5⅝	— B 3½ p.c.	111—113	..	4 19 1
79,416	,,	Dec. 28	3	— C 3½ p.c.	79—82	..	3 13 2
845,872	,,	Feb. 28	5⅝	— 3 p.c. Deb. Stk	101—104	..	4 18 6
185,000	,,	,,	5	West Ham 5 p.c. Ord.	120—123	..	4 1 4
228,300	,,	Dec. 28	4	Do. 5 p.c. Pref.	102—105	..	3 16 2

Prices marked * are "Ex div."

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Applications, in writing, stating Age and Experience, to the ENGINEER, Gas-Works, DEVONPORT.

WANTED Two or Three Gentlemen to Sell Gas Coal. Must have good Connections with Gas Companies, not necessarily Gas-Coal Connections.

Apply, by letter, stating District known, with full Particulars, Age, and Salary required to No. 4736, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

WANTED by a Water and Gas Company in the South of England a SUPERINTENDENT for their Show-Rooms and Gas and Water Fittings Department. Must be of good address, a capable Manager of Men and a Cyclist. Commencing Salary £2 per week.

Apply, in own handwriting, giving full Particulars of Experience and present Occupation (References not necessary in first instance), to No. 4742, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GUERNSEY WATER COMPANY, LIMITED.

THE Guernsey Water Company require the Services of an ENGINEER-MANAGER. Age about 30. Must have had Experience of Water-Works Distribution. Knowledge of French will be an advantage. Commencing Salary £200 per annum.

Applications, stating previous Experience, and accompanied by *copies* only of Testimonials, must be sent in on or before Wednesday March 27, 1907, addressed to Mr. ERNEST D. DAVEY, Secretary, Guernsey Water Company, 28, Victoria Street, Westminster, S. W.

COUNTY BOROUGH OF DEVONPORT.

(GAS DEPARTMENT.)

OUTDOOR SUPERINTENDENT.

THE Gas-Works Committee of the Devonport Corporation invite APPLICATIONS for the Appointment of OUTDOOR SUPERINTENDENT.

He must have had full Experience in all departments to supervise, under the direction of the Engineer, the whole of the outdoor work—Mains, Services, Ordinary and Automatic Installations, Stoves, Public and Private Lighting, &c.

Salary to commence at £125 per annum, to increase £5 the first year and £10 each of the two succeeding years.

Applications, stating Age (which must not exceed 45), Training, and present Position, with three References only (not Testimonials), to be forwarded to the undersigned before the 22nd of March, endorsed "Superintendent."

None need apply except those who have held a similar position.

JOSEPH WM. BUCKLEY,
Engineer, &c.

Gas-Works, Devonport.
March 9, 1907.

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EDITORIAL NOTES—GAS, &c.

London Gas Coal Contracts.

THE London Gas Companies whose demands are the largest have got to close quarters with the coal owners; and it is a stubborn tussle that is going on between the contending parties. The Companies are showing the Durham owners that, while they possess the coal and can stand as firm as they please upon what they "consider" to be, as one mild-mannered reporter puts it, "the true market value of their "coal," gas coal buyers are quite strong enough to make things uncomfortable for any particular district when the market value ascends to what they, on their part, consider to be unrighteous heights. If they suspect "understand-"ings" between sellers for maintaining undue prices, reprisal may be warranted in order to bring things to their proper bearings, even with a little sacrifice, by diverting custom to other districts. It comes to this, that coal owners have boasted of their strength of purpose because they hold the coal that the gas undertakings want. But, on the other hand, the gas undertakings have the money to spend that the coal owners are desirous of handling; and the administrators of the gas undertakings can spend that money in any coal district that they like to choose. The two largest London Companies have been making considerable purchases in Yorkshire; and to the extent (see "Coal Trade "Reports" in this issue) that they and other undertakings have done so, and continue to do so, so much the worse for the Durham owners. The London Companies have not discontinued negotiations in Durham; but they are, so latest advices state, still refusing to give the prices quoted. The reports that come to hand from Durham remain vacillating in tone. The prices of 12s. to 12s. 6d. are mentioned for immediate sale; but 12s. 9d. is quoted for next month. The reports from Yorkshire have an exceedingly joyful note about them, owing to the large bulk of business that has been and is being settled, at about 2s. 6d. higher than last year's contract rates. Prices quoted are: For screened coal, 10s. to 10s. 6d. per ton; unscreened 8s. 6d. to 9s.; nuts, 8s. to 9s. The demand for nuts is stronger than ever. Nottinghamshire also seems now to be sharing with Yorkshire in the good business with gas-works, both near at hand and distantly situated.

A Suggestive Presidential Address—

The Work and Funds of the Institution.

IN 1901, Mr. Corbet Woodall was the President of the Southern District Association of Gas Engineers and Managers; and he then delivered an address which we, with the full consciousness that the judgment would be universally ratified, described as "brilliant." Last Thursday, Mr. Harold W. Woodall was installed in the same position that his father occupied six years before; and he also delivered an address to which the same descriptive characteristic may be truly ascribed. The address was alive with independence of thought, with initiative, and with the spirit of inquiry—right away from the opening remonstrance as to the inequalities under which the gas and electricity industries operate (to the detriment of the former) to the description of the Woodall-Duckham vertical retorts as constructed on the improved lines that patient inquiry and effort, and indomitable will, have produced. And not only in relation to the essay to attain, by the combination of known methods (a combination which was only to be ultimately realized by skilful and inventive adaptation), the never before successfully achieved ambition of many engineers—continuous carbonization, but in other departments of operation, the beaten track only suffices at Bournemouth so long as some easier or more productive route to an end cannot be found.

The Bournemouth Gas and Water Company, among other things, have successfully invited co-operative relations with their workmen by what is known as a "Suggestions "Box." The Council of the Institution of Gas Engineers will not fail to notice that this address of Mr. Woodall's is a veritable "Suggestions Box" for them and others, though there may be some disagreement with the propounder of the suggestions. The first one is not addressed to the Council of the Institution; but it concerns any two or three Gas Companies who may be affected by the clause which certain electricity supply companies have introduced into agreements which, in consideration of special terms, prohibit a consumer from using any other methods of lighting during his term of tenancy of the property concerned. It is believed that such agreements are *ultra vires*. Section 20 of the Act of 1882 distinctly specifies that, in the making of agreements for the supply of electricity, undertakers are not to show any "undue preference" to any local authority, company, or person; and besides this an agreement such as that to which the President calls attention overrides the liberty that the General Gas and Electric Lighting Acts confer upon the householder, of demanding a supply of either gas or electricity. It would be an easy matter for two or three companies to test the question as to the power of an electric light company to insert such a clause; and we hope, with the President, that this may be done at an early date.

Suggestions to the Council of the Institution, of lines of work along which they may devote their energies, fell thick and fast in the address. We all admit the necessity for the amendment of the Gas-Works Clauses Acts; but the question of attainment is the one for present consideration. In the Council's report last year, it was stated that the matter of obtaining an amendment of the Acts had been brought before them, and had been referred to the Parliamentary Committee for consideration and report; and in the circular appealing for contributions for the Special Purposes Fund (and which circular had such lamentable ill-success in its mission), allusion was again made to the desirability of the modification of general gas legislation. The Council have carried this matter as far perhaps as it is advisable to go at the present time. It has been rumoured (and we shall possibly have confirmation of this when the annual report of the Council is issued) that the Board of Trade have intimated very plainly that amendment of the Gas-Works Clauses Acts in one direction must be accompanied by amendment in other directions. The amount and nature of the revision that the Board would propose are unknown quantities; and it would be the height of folly for the Council to commit the gas industry in any way by taking a leap in the dark. The Gas-Works Clauses Acts—in effect though not in intention—affect Gas Companies more than gas-supplying municipal authorities. All come under the Acts; but in the case of the latter there is no watching authority to compel obedience to much of the general fundamental law. We are passing through a period when private enterprise is not regarded in the best light by the powers that be; and caution with a view to the protection of interests must be strictly observed. Another suggestion that the President made is that the Institution should refute, by obtaining the opinions of high and honoured authorities, the damaging statements of competitors as to the pernicious effects of the products of the combustion of gas on health, fabrics, leather, and decorations generally. We believe that the London Gas Companies are at present working in this direction, with the aid of experts; and it would be wasted energy and money for the Institution to also engage in this particular work. There was a considerable amount of evidence given on these matters before Lord Rayleigh's Committee; but something more conclusive is now being sought.

We are forced to disagree with the President as to the character of the work that should be undertaken by the

Gas Companies' Protection Association, and as to the absorption of the work of that body by the Institution. The Institution is a technical body; the Gas Companies' Protection Association in its aims is not, and there has always been care exercised to avoid any trespass on the ground occupied by the technical organizations. Furthermore, the Institution is a composite body; the Gas Companies' Protection Association has only membership drawn from privately owned undertakings. In many ways, the interests of municipal authorities and companies have common ground; but administratively and legislatively they are sometimes hostile. Therefore at times—but not always—the matters dealt with by the Association, if undertaken by the Institution, would not be consonant with the views of the municipal authorities whom a large proportion of the members serve. Let us instance the work done by the Association in opposing the Electricity Supply Bill, in assisting in pressing for protection to underground pipes against electrolysis, in opposing the granting of powers to municipal authorities for speculating in free electrical wiring and fittings, and in other ways. The Gas Companies' Protection Association must remain an independent entity, and not have its activities shackled, as they would be if governed by an Institution some of the members of which could not be loyal to their employing authorities and at the same time extend sympathy to part of the work carried on by the Association.

Research and pioneer work cannot be prosecuted without money; and mention has already been made of the ill-success of the appeal of the Council of the Institution to enable them to explore and to assist in clearing away obstruction. The President of the Southern Association holds that the Institution is now an "excellent organization;" and in an after-dinner speech on the same occasion, Mr. Corbet Woodall acknowledged that, in constitution, the Institution holds a commanding position for technical work in the gas industry, though, at the same time, he alluded to the investigation now being conjointly conducted by the London Gas Companies, and to the amplitude of their resources. However extensive the resources of the London Gas Companies (and the gas industry is beyond measure indebted to them for having put those resources to the best possible use in the past and in the present), there is one resource in which the Institution are superior, and that is the vast body of intellect represented by the hundreds of members, among whom are included all the chief professional men of the Metropolitan gas industry. Not so very long since we were constrained to express regret that the Institution should have been maimed at the outset of their attempt to commence operations on fallow ground. But a ray of hope burst through the gloomy aspect of affairs in this particular regard at the Southern meeting. A sanguine temperament has carried the President of the Association far in his special work, and it comes to the surface again when he says he does not apprehend any difficulty on the part of the Institution in securing funds. And what is of importance, Mr. Corbet Woodall corroborates. "If," he says, "the work undertaken by the Institution is "likely to be productive of good, there will be no lack of "funds to carry on the work. There is patriotism among, and "*camaraderie* enough between, the Gas Companies and the "Corporations of the country to cause them to join heartily "in any such work for the benefit of the whole industry." Mr. Woodall knows the industry thoroughly; and his position in it carries great influence. The President of the Institution (Mr. Charles Hunt) did not let the opportunity slip. He announced that the Council of the Institution have undertaken to investigate one subject, and that the important one of carbonization. This is confirmed by a paragraph which appears elsewhere. By this investigation, it is hoped, to bring to a focus what has been done, and what is being done; and by this means to do something towards raising the level of carbonization. Better work, with judicious handling, could not be undertaken by the chief technical body. The problems are many; and the vertical retort has led to their increase. The inquiry lies at the very root of gas manufacture; the important subject that the London Gas Companies are investigating is found at the end of gas utilization. Between the two extremes, there is much else to engage in the future the best talent the Institution can command. The determination of the Council should commend itself; it certainly undermines much of the criticism to which they were exposed not many months since. For these and other reasons, as we have said, the President of the Institution did well in taking advantage of his opportunity, by expressing the hope that the Special Purposes Fund of the Institution would soon receive an important contribution from the great Company of which Mr. Corbet Woodall is the respected Governor. And we would add from all gas companies and local authorities who have not yet subscribed.

These important matters were raised by the address delivered in the afternoon by the President of the Association; but they only formed a small part of the subject-matter. Sound views are held by him as to the relations between employers and employed; and many profitable lessons in this respect are to be gleaned at Bournemouth. He believes that eventually salvation will be found in profit-sharing; but meantime he and his Company are doing an excellent work, by affording educational facilities, in improving the intelligence of their men, by which means both men and Company must benefit. Experience has firmly planted the conviction in the President's mind that any encouragement extended to the men will receive their support. Greater consideration for foremen is also advocated; while recreation is not overlooked. Information of value is also given as to the road conveyance of materials by motor traction, and as to the coal and electric-driving arrangements at the Bournemouth Company's new works at Poole. There will be passing disappointment that more was not said respecting the process of continuous carbonization under the Woodall-Duckham system. A description of the setting as now, it is hoped, perfectly developed is included towards the end of the address; but there is still absence of results. We appreciate, as all engineers will do, the reticence of the President in publishing results. Until the process constituted of many parts was faultless in every one, reliable figures were impossible. There have been many mechanical difficulties to overcome; and much balancing of methods to be effected. Hence the length of the developing and probationary period. But from the setting as now described, we may look in the near future for accomplishment that it is hoped will be the realization of advance in the product of carbonization and in technical knowledge.

National Physical Laboratory at "Question Time."

The unsatisfactory composition of the Committee recently appointed by the Treasury to inquire generally into the work performed at the National Physical Laboratory has already been referred to in the "Journal" (see *ante*, p. 456). Since the date (Feb. 19) of our remarks, the spokesmen of the Treasury in the House of Commons have had quite a lively time in answering questions asked by members on both sides of the House as to the Laboratory and the Committee of Inquiry. The matter, as befits a scientific and technical question, has been kept clear of political partisanship both within and outside the House. In the Daily Press, "The "Times" and the "Tribune" have vigorously called for the reconstitution of the Committee of Inquiry. The Technical Press, too, is singularly unanimous in the same sense. The "Engineer" has dealt exhaustively with the question, on which, also, a contemporary whose views we regret are commonly at variance with ours—viz., the "Electrician"—is in thorough agreement with us.

Sir W. Evans Gordon opened the subject in the House of Commons with a brace of questions addressed to the Secretary to the Treasury. The first referred to the public discontent with the policy of the Executive Committee of the Laboratory, and to the undertaking by the institution of routine commercial testing, "in spite of the fact that all "the witnesses examined by the Treasury Committee ot "1897 were, without exception, agreed that no such work "should be done by the Laboratory." The second question recited that the Laboratory was brought into existence for the express purpose of carrying on research work for the good of the community, and it was asked what steps were taken to prevent the undertaking of routine commercial testing curtailing the quantity and usefulness of the research work, and defeating the object for which the Laboratory was brought into existence. Mr. Runciman replied on behalf of the Treasury, on the 7th inst., that a Committee were considering the points raised, and that pending their report no statement could be made. Two questions asked by Mr. Nield drew, however, from Mr. Runciman on the same date answers which throw an interesting light on the appointment and scope of the Committee. The first question called attention to the fact that two of the five members of the Committee of Inquiry were also members

of the Executive Committee of the Laboratory whose policy was called in question; and the appointment of a Committee independent of the Laboratory was asked for. Mr. Runciman replied that the two members referred to "were nominated by the Royal Society to represent its views at the "invitation of the Treasury. The remaining members were "appointed directly by the Treasury."

The humour of this reply lies in the fact that it is the Royal Society which appoints a majority of the Executive Committee of the Laboratory, and that it is the policy pursued by that Committee and the staff controlled by it which is the subject of inquiry! Mr. Nield's second question was as to whether the Committee of Inquiry "had been instructed "to report whether it be to the public advantage that the "National Physical Laboratory should continue to compete "with private testing establishments." Mr. Runciman's reply was very interesting, as it stated the terms of reference to the Committee, from which it appears that what had hitherto been published was only a summary. The Committee, he informed the House, was appointed "to "inquire generally into the work now performed at the "National Physical Laboratory, with special reference to "(1) the character of the mechanical, physical, and chemical "tests undertaken there; (2) the possibility of their interfering unduly with the business of other agencies; "(3) the desirability of publishing the results of all such "testing work; and to report whether, having regard to "the industrial interests of the country generally and to "those of private agencies, any change is desirable in the "scope of the work of the laboratory, and on what lines "any further development of its business should proceed." The sting lies in the tail. It is not for the Committee to curtail the business of the Laboratory, and so bring it within the bounds set for it at its inception, but instead to remove these obnoxious obstacles to its ambitious career, and so pave the way for further development. And two-fifths of the members of the Committee to which this whitewashing and facilitating charge is entrusted have, in their capacity as members of the Executive of the Laboratory, been responsible for the overstepping of bounds of which such legitimate complaint has been made in the past!

Several more questions have since been asked in the House as to the work and finances of the Laboratory and regarding the Treasury Committee; but as, in one case at least, the answer has been deferred until to-day, we may fitly postpone comment on them until next week.

Coal, "Coalite," Coke.

THREE degrees of comparison are here illustrated. If the fuel is for the domestic hearth, the common verdict will, we fear, continue to allot the superlative degree to coal; but if the fuel is for metallurgical use, the order will be reversed, and coke will inevitably rise to the superlative rank. In both cases, "Coalite," whatever its cost, origin, or nature, is almost certainly doomed to the comparative degree, or the position of mediocrity. Since we referred last week to the curious reticence of those engaged in exploiting "Coalite" as to the process by which it is manufactured, Dr. Grossmann has contributed to the "Manchester Guardian" a second article upon "Smokeless Fuel from Coal." He is clearly sceptical of the merits of the mystical "Coalite" process; but he seems to think that some mode of producing relatively smokeless fuel from coal might prove a commercial success, but that we have not sufficient data available to make a more definite pronouncement. He clearly pins his faith to a larger yield of ammonia than is achieved in either gas-works or coke-oven practice, and makes the following statement: "There are means of manipulating coal in such a manner "as to obtain half the amount of the nitrogen as ammonia; "but they have so far not been applicable to gas making, "and in that industry only about one-fifth of the nitrogen "is recovered as ammonia." Later, after referring to the difficulty of computing the value of tar produced at a low temperature of carbonization, he says: "As regards the "quantity of ammonia which might be recovered at a low "temperature, we are even more in the dark."

Dr. Grossmann nowhere alludes to the Mond gas process—perhaps because it is not a coke-making process; but we think that it should be borne in mind when the prospects of "Coalite" are under discussion. Following up the view enunciated by Mr. W. J. A. Butterfield that the staple product of the Mond gas process is ammonia, we get a very interesting comparison of the merits for different purposes of the three important modes of carbonizing coal. Thus, regarding only the three products, gas, coke, and ammonia, the results are broadly—

	Gas.	Coke.	Ammonia.
Gas-Works	*Staple product;* yield and quality good	Yield good, quality indifferent.	15 per cent. yield.
Mond Producer	Yield large, quality bad; being largely products of combustion.	Negligible	*Staple product;* 50-60 per cent. yield.
Coke-Ovens	Yield good, quality indifferent.	*Staple product;* yield and quality good.	Generally neglected; yield of 15-20 per cent. possible.

Now it is obvious that a high yield of ammonia, which Dr. Grossmann regards as the condition of success for a smokeless fuel process, has already been achieved in the Mond gas producer, which utilizes slack coal—that is to say, precisely the raw material from which it is understood "Coalite" is prepared. At what cost is the high yield of ammonia obtained? The loss of virtually the whole of the coke, and the partial combustion of the gas! Yet, under the "Coalite" scheme, it is expected that fuel much superior to coke will be produced, that good gas will be made, and that a high yield of ammonia (and other bye-products) will be secured. Those who hope to make a high yield of ammonia pay for a gas-making process, should study the report of last year's working of the South Staffordshire Mond Gas Company (*ante*, p. 630). Technically, it is practically impossible for a high yield of ammonia to go hand in hand with the production of a good quantity of gas of good quality, even if the coke or other residual solid fuel is wholly sacrificed. The pioneers of "Coalite," however, put the production of such a fuel of high grade in the foreground; and, that being the case, it may be foretold that the yield of ammonia and the yield and quality of gas will pass very far into the background. There is a limit—which is not far from being attained in the gas industry at the present day—to the possible returns from the carbonization of coal, and that limit will certainly not be approached when carbonization stops half way. "An ingenious and absurdly simple "process"—to quote Sir W. H. Bailey's description of "Coalite" manufacture—cannot work technical miracles.

The reference that was made last week to the secrecy that is being maintained over the "Coalite" process can now be supplemented. Sir William Bailey, in the letter from which extracts were made in our last issue (pp. 735, 741), stated that the Coal Smoke Abatement Society had reported on "Coalite" as a fuel. In reply to an application to the Society for a copy of the report, the Secretary courteously informs us that the report has not been made public; but "possibly the proprietors of 'Coalite' might be willing to "let you see it." We are afraid the Secretary of the Society does not know much about the liberality of the proprietors of "Coalite" in giving information to the Technical Press; but, knowing what we do, time has not been wasted in a journey or in starting correspondence that would have been unrewarded.

Nottingham Gas Inquiry.

Although the Committee presided over by the Mayor of Nottingham have held several sittings, and evidence of an exhaustive character has been taken, there is a growing feeling locally that the proceedings are more or less in the nature of whipping a dead horse. In numerous reports to the Council the Engineer had from time to time made his position clear; and while his testimony serves to accentuate the importance of the views which he had previously consistently enunciated, it is more or less in the nature of a repetition, as to substantial facts, of much that was already known. What the public appear desirous of obtaining information about are some piquant details which it is understood were brought under the notice of the Special Committee of Investigation. But, as long as the law remains what it is and the Committee now sitting are impotent to grant indemnity to witnesses against possible subsequent legal proceedings, it is doubtful if the curtain will ever be drawn fully aside. That in regard to engineering details Mr. Brown has presented a case which abundantly supports the views which he has from

the first upheld, the inquiry has already made unmistakably clear. Though it seemed a trifle bizarre for non-technical committee-men to be examining on points of engineering detail, Mr. Brown invested his replies with characteristic lucidity. But, after all, merely the fringe of the matter has been touched from the point of view of the ratepayer, who is desirous of knowing something as to the means whereby Trades Union influence, as represented by the gas workers, has been brought to bear in favour of a particular section in the Council, upon a basis which has often proved inimical to the commercial interests of the Corporation gas undertaking. As long as that is all skilfully deleted, the inquiry becomes more or less in the nature of a solemn farce. Nottingham is not the only place in which, acting through pliable representatives, Trades Unionism has been allowed to "rule the roast" in regard to important sections of municipal work; and the time has arrived when obviously it would be to the general interest of ratepayers if there were some authority invested with statutory powers to deal with these matters in no uncertain way.

London Gas Testings.

We have redeemed our promise, in other columns, to make further examination of the London County Council returns of gas testings. From the results of the testings are shown the advantages that recent legislation has conferred relatively upon the three Metropolitan Gas Companies; and among the points made is the one that the South Metropolitan Company, who bore the brunt of the fighting for the reduction and the proper testing of illuminating power, have, in adhering solely to coal-gas manufacture, scored the least in benefit. Another point advanced for consideration is that provincial companies supplying straight coal gas of 16-candle power and under should now ponder well, if pressed for a reduction of standard price, the comparative value of the loss of standard price and the reduction of prescribed illuminating power. Circumstances can be pictured (where coal gas only is supplied, and gas makers cannot "free-wheel" as they can do when in possession of water-gas plant) where it might be better to secure modern testing conditions, and for the present leave the existing (if readily attainable in working) prescribed illuminating power alone. But all the same we have a great liking for the liberty given by low prescribed illuminating powers. Lessons are also drawn from the returns regarding flat-flame testing, calorific power, and sulphur purification.

Fate of the Metric Bill.

Last Friday, after a debate, in the course of which both sides of the case were most ably put forward, the House of Commons decided—by 150 to 118 votes—that the Weights and Measures (Metric System) Bill should not be read a second time. As with other highly controversial subjects, the decision of Parliament is not likely to be universally accepted as a final settlement of the rights or wrongs of the case. Those manufacturers and traders, however, who were fearful of the expense that would be entailed on them by a compulsory change in their system of weights and measures will breathe more freely, for a time at any rate; while those others who believe that their businesses would be materially assisted by the alteration, are free to test the metric system by introducing it at their works in the same way as has been done at Kynoch's by Mr. Arthur Chamberlain, whose attitude on the question was referred to in the "JOURNAL" a short time ago. The Bill which was rejected last week suggested that the change should come into operation within three years (which was an improvement on the two years proposed by the 1904 Bill); and its introducer, Mr. Straus, pointed out that resolutions in favour of the measure had been passed by the London County Council and by numerous other bodies, as well as by the heads of many trade and engineering firms and members of Trade Unions, who presumably agreed with him as to the "three reasons" why the Bill should be read a second time—namely, the loss of time and money in business and trade involved in the present system, the most serious waste of time in the education of children, and the loss of commerce with other countries owing to our dealing in weights and measures which to them were incomprehensible. Had there been any school children present at the debate, it is easy to imagine which way their sympathies would have gone, when they heard Mr. Straus say a French elementary schoolmaster had estimated that his pupils learnt compound arithmetic in twenty hours, for which English children required four hundred hours; and that while the metric system could be put into seventy-two words, ours required many thousands. This, however, is only one side of the case; and Mr. Haworth, moving "that the Bill be read a second time this day six months," pointed to the enormous cost that the change would entail, and to the fact that though thirty-seven out of forty countries had adopted the metric system the "miserable minority" of three consisted of Russia, the United States, and Great Britain, who in respect of population and commerce in reality constituted a majority. He referred to the many firms and organizations who were opposed to the alteration, and urged that, instead of tyrannically forcing it upon them, the people should be left to adopt the metric system or not as they thought fit. Mr. Lloyd-George admirably summed up the debate; and, while admitting that if it were possible to introduce the metric system without doing any great injury to trade everybody would be glad of it, he contended that until traders and manufacturers came to some understanding on the matter, Parliament would be acting unwisely in forcing upon the country a measure for which it was unripe.

Income-Tax.

Agitation has been commenced, and it is hoped will be actively persisted in, with the view of securing some mitigation of the lot of the income-tax payer. The tax is, everybody admits, in the present times of peace, too high, and its incidence unjust. It presses heavily on the middle salary-earning class; and it is that middle salary-earning class whose savings—we remember Sir George Livesey calling attention to this point some time since—supply a large proportion of the capital employed in the industry of this country. On their savings income-tax has been paid; and on the product of their savings, income-tax is also paid. It is not contended that on the latter income-tax should not be levied. But the tax has become, whatever its original intention as an emergency or war tax, a part of the permanent finance of the country; and we do hold that a tax, in periods of peace, of 1s. in the pound is an unjust and indefensible impost on the industrious and the thrifty. Before the Boer war, 8d. in the pound was regarded as a fair and normal rate for the tax. It is about five years since the close of the war; and the burden still stands at 1s.—notwithstanding that 1d. in the pound now produces £2,600,000, compared with £2,000,000 before the war. The country is very prosperous just now; and the hope is being indulged that the Chancellor of the Exchequer will have a surplus of about 5 millions with which to deal. The time is therefore favourable for agitation, so as to impress the views of the country on the Government. Mr. Gladstone once said that "the facility for recurring to, and maintaining, the income-tax, had been the main source of extravagant government;" and in this he was not far wrong. The shareholders in gas companies, large numbers of whom are dependent upon the modest returns they receive on their investments, will heartily welcome an abatement of the burden that has so long been imposed, and that Chancellors of the Exchequer have been so unwilling to relinquish. The "facility" for maintaining the tax at a high level has by them been, in late years, demonstrated up to the hilt.

With regret, we have to announce the death on the 22nd inst., in his 71st year, of Mr. THOMAS HENRY GOODWIN NEWTON, who for the long period of 43 years was connected with the administrative work of the Imperial Continental Gas Association. An auditorship was the stepping-stone to the more responsible office of Director; and of the Board he was a member for 39 years. His services for the Association resulted in his elevation to the chair in succession to the late Sir Julian Goldsmidt. For many years, he presided over the fortunes of the great undertaking with conscientiousness, ability, and a broad-minded regard for those immediately associated with him and for the officers and staffs of the concern. In the opening years of the new century, it was obvious that his health was failing; and there came the break in his appearance at the proprietors' meetings at the first one held in 1903. Then Mr. J. Horsley Palmer presided; but before the next half-year's meeting, the proprietors had learned that the arduous duties devolving upon the Chairman of such an important concern had necessitated Mr. Newton relinquishing the burdens of the chair, which Mr. Palmer then took up. Mr. Newton's vast experience, however, was not entirely lost to the Board, membership of which he retained. But though in travel and other ways he sought recuperation, his health did not mend; and he felt constrained to finally retire from participation in the direction in the early part of 1906. The records of the Association will memorize his long and faithful service during a period in which many events of vast importance to the concern occurred.

NOTES FROM WESTMINSTER.

When the stirring times of a few years ago in the Committee-rooms and corridors are remembered, when Counsel and witnesses rushed in feverish haste from room to room, the present torpor is somewhat dispiriting. Everyone tries to look happy; but there are those who are largely dependent on Committee work who while on one engagement are musing profoundly on the question as to when the next one is likely to come along. Unless there is some tangible recompense attaching to the infliction, one does not appreciate spending day after day in a room listening to gentlemen all of whom would, if asked, claim to be Truth incarnate, flatly contradicting each other as to the eligibility or otherwise of particular sites for gas-works. That was practically all that was happening last week in the Committee-rooms from which a spark of interest could be raised; and therefore one can conscientiously write that things were very flat. Settlement continues to do its peaceful work, and the busier becomes the Unopposed Bills Committee. The Easter recess will be quite a relief, as it will give a break to monotony; and then on April 9 we are promised a turn with the Hull Purchase Bill before the Police and Sanitary Committee. Announcement was made last week as to the terms of settlement in the Mitcham and Wimbledon Gas Company's Bill; and there has only been an adjustment of clauses since. On Tuesday a fresh Committee, presided over by Mr. A. Hutton, started to investigate the requirements of the Worthing Gas Company and the grievances of their opponents. The Unopposed Bills Committee considered a few Bills—Brockenhurst, Maidstone, and Grays—on Friday. They would have disposed of them the previous day, had not the Commons got into such a peculiar state that the members persisted in extending one sitting over the length of time that it took the small hand of the clock to traverse the face twice. An all-night sitting is just one of the pleasantries of parliamentary life. No particular point arose on the Unopposed Bills referred to.

A Question of Site. The Worthing Gas Company's request to Parliament is for land purchase powers (it being necessary to start new works), for authorization to extend their limits of supply, and to consolidate and convert their capital, and for sanction to additional money powers. The financial part of the Bill did not evoke any hostility; but the site which Sir George Livesey, Mr. Charles Hunt, Mr. Joseph Cash and Mr. W. A. Walker, the Company's Engineer and Manager, said was the best one obtainable for that economy of working which would benefit community and Company alike, was opposed by landowners. Though Rural and Parish Councils appeared, it was freely admitted that it was a landowners' opposition. The chosen site is at Goring, outside the boundaries of the borough of Worthing, it adjoins a railway, and is 18 acres in extent. It is desired to erect as quickly as possible a holder upon the site, and connect with the old works by a high-pressure main. The present holder accommodation is only about two-thirds of the maximum daily output; so that safety ought not to allow the provision of supplementary storage to be delayed any longer than is necessary. The opposition pointed out another site, which their witness, Mr. E. H. Stevenson had done the honour of inspecting from a railway train—in motion or otherwise was not disclosed. The suggested alternative site seemed to suffer from the disability of having no decent means of access such as are required by a gas-works. A trifle like this was airily disposed of by Mr. Stevenson. The Hon. J. D. Fitzgerald, K.C., for the local Councils (Mr. Ram, K.C., was for the landowners), treated those present on Wednesday afternoon to quite a nice homily, delivered in suitably solemn tone, on "Bear ye one another's burdens;" but somehow or other he twisted his discourse round so that it was forced upon the Committee's notice that Goring, generous minded as the people presumably are, did not want to accept the injunction, in its literal or other sense, by bearing the burden and the supposed "nuisance" of Worthing's gas-works, and all the fancied evils that gas-works bring in their train. We do not yet know what the upshot of the matter is, seeing that the Committee have been in communication with the Board of Trade regarding certain points, and could not receive their answer until yesterday afternoon. The parties were therefore informed that the Committee would announce their decision to-day (Tuesday).

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 836.)

The Stock Exchange has had another very disheartening week—fits of depression alternating with fallacious symptoms of amendment. The opening brought little promise; for the American war in Wall Street was raging again, and another failure was announced. The next day was as bad, or worse, and accounts were eagerly liquidated; but Consols kept up. Then followed a rather brighter pause; but this was soon overcast by a rise in the French bank rate—a phenomenon which had not occurred for nearly seven years. Much anxiety regarding future monetary movements was produced; and on Friday the dominant idea seemed to be that accounts had better be liquidated quickly. The tone on Saturday was very bad. Prices crumbled away, and one thing dragged down another; while the gravest apprehensions were entertained that the approaching settlement would involve a train of disasters. In the Money Market, there was always an abundant supply to meet the demand for short loans; but discount rates hardened considerably as bills were not readily taken. Business in the Gas Market was remarkable, there being an unusually large number of transactions in the two leading issues. But these were for the most part condensed into the first half of the week, leaving the last half conspicuously barren. Movements were rather mixed, some being one way and some the other. But on balance, the rises outnumbered the falls; and the prevailing tendency was not unfavourable. In Gaslight and Coke issues, the ordinary was very active and very steady; a large number of dealings taking place at the same figures and within the same limits as the week before—viz., 95½ to 96¾. Some moderate business was done in the secured issues; the maximum changing hands at 87½ and 89; the preference, at from 106 to 107; and the debenture, at from 82½ to 84. South Metropolitan showed increased activity, and transactions ranged from 121 to 122½. Commercial were almost entirely neglected; no business being marked except a couple of deals in the 4 per cent. at 108 and 109. The Suburban and Provincial group were a little more animated. Bournemouth original marked 27⅝ and 27¾ (after which the quotation rose ½), ditto "B" 16½, Brentford new 194, Brighton original 223, North Middlesex 19½, Wandsworth "B" 140, West Ham 102½, ditto preference 122, while the quotations of British and Bromley had a slight advance. The Continental Gas Companies were rather quieter. Imperial was weaker, with transactions at from 179 to 177, and one special at 176—the quotation falling 2; Union marked 121½ and 121 (a fall of 1); and European part-paid was done at 18½ and 18⅜. Among the undertakings of the remoter world, Buenos Ayres changed hands at 11⅝, ditto debenture at 94½ and 93¼, Primitiva at 7⅝, ditto preference at from 5 to 5⅛, ditto debenture at 95½ and 96, River Plate at 12⅜ and 12⅝, ditto debenture at 95½ and 95¾, San Paulo at from 13¼ to 13⅜, Cape Town debentures at 52 and 52¼ (a rise of 1), and Melbourne 5 per cent. at 101½.

AN INTERNATIONAL GAS EXHIBITION FOR PARIS

A circular, under date of the 21st inst., has been issued by the Société Technique de l'Industrie du Gaz en France, announcing that it is suggested to hold in Paris an International Gas Exhibition, under the auspices of the French Gas Society, the "Chambre Syndicale de l'Industrie du Gaz," and the "Chambre Syndicale de l'Eclairage et du Chauffage par le Gaz." The idea, as the circular states, has originated in the successful gas exhibition at Earl's Court in 1904, which, it will be remembered, was honoured by a visit of representatives of France and other countries. A Provisional Organizing Committee has already been appointed; and they think that the present time is an opportune one for the launching of a comprehensive exhibition.

The circular says that "the comparison of statistics from abroad with the figures of our own country shows how much we are still behindhand in France in the utilization of coal gas, and gives us an insight into what we may rightly hope for and obtain. We think, therefore, that, in order to drive the public out of its indifference as regards the uses of gas, it is necessary to make a *grand coup*." It is hoped to make the proposed exhibition truly international, so that the public will be able to compare French and foreign apparatus, and also lead French manufacturers to make progress and to take note of new ideas from whatever quarter they originate.

An appeal is made for the guaranteed sum of 250,000 francs (£10,000), which, or at least some of which, it is of course hoped will be returned should the exhibition prove a success.

It is proposed to classify the exhibits into eleven groups, as follows: (1) Works' Plant; (2) Coal; (3) Lighting; (4) Heating and Ventilation; (5) Motive Power; (6) Gas Measurement; (7) Direct Bye-Products; (8) Laboratory and Testing Apparatus; (9) Various Industries relating to Gas; (10) Hygiene; (11) Gas Technics: Documentary, Legislative, and Economic.

The date suggested for the exhibition is from September to November, 1908. The patronage of public authorities, the Municipality of Paris, and the assistance of foreign Gas Societies is asked for. Here, on our part, we can only say that we welcome the suggestion, and heartily wish our French friends the greatest possible success with their exhibition.

The Chemistry of the Rare Earths.—At a recent meeting of the Chemical Society, Signor Mario Esposito submitted a further communication on the above subject. He showed therein that the methods of Muthmann and Böhm and Pattinson and Clarke for the preparation of ceria, have been found to give a fairly pure product. Oxidation with potassium permanganate, according to Drossbach and Böhm's method, is probably the most rapid and satisfactory way of obtaining almost pure ceria. Lanthana and old didymia can be separated by fractional crystallization of the oxalates from strong nitric acid; but the process is not advantageous. Lanthana is best obtained by a modification of the method of Baron Auer von Welsbach (fractional crystallization of the double ammonium nitrates), which at the same time effects the separation of neodymia and praseodymia, the chief constituents of old didymia.

ELECTRIC LIGHTING MEMORANDA.

Flame Arcs—Disappointed Shopkeepers—A Broad-Minded Writer—Difficulties and Light Distribution—"Progress" in Complication—Public Lighting Complaints—Municipal Mismanagement.

EXPERIENCE has a wonderfully chastening effect. A few months ago, it was impossible to look into our electrical contemporaries without being greeted with almost hilarious references to flame arc lamps and their so-called successes. But the lamps are dealt with now in a more sober and business-like spirit. The flame arc lamp is not all that the electrical industry expected it would be, nor is it doing for the industry all that was anticipated. A few of these lamps, used for outside shop window lighting, have been under special observation by us. The proprietor of one of two shops has had the lamps removed, and incandescent gas-lamps have again been installed. At a second shop, the proprietor is complaining of the extra expense and trouble of the lights; and his lady customers are adding to his annoyance by complaining that the row of dazzling lights outside his window prevents them properly inspecting the goods displayed inside. That is not what the proprietor intended in going to the expense he did in installing the lights. The flame arcs may attract from the distance, but they repel on closer acquaintance. The shopkeeper does not want, by over-doing the lighting, to defeat the object of the display of goods in the window. The same shopkeeper reports that, though his expenses for lighting have risen considerably during the winter months, compared with the preceding winter, when incandescent gas lighting was employed, he fails to find the *quid pro quo* in his account books. He is a disappointed man; and we are anticipating that the experience will have as its result, when deterioration has completed its work of rendering the lamps useless, that clusters of incandescent gas-burners, which have no dependence on internal mechanism of any kind and are free of all complication, will reign again in the positions from which they have, we believe, only been temporarily ejected. Meanwhile, this shopkeeper is making no secret of the want of success of the flame arcs among his fellow tradesmen, and though these tradesmen have been invited to change over, have been interviewed, and have heard all manner of evil things said against their present system of lighting, they sit tight, contented with the testimony of a neighbour, without paying for the experience.

Mr. H. S. Hatfield, B.Sc., has been writing on the subject of flame arc lamps in "The Electrician." It is rather significant that he opens the article with these words: "There can be no question that the flame lamp represents the most efficient form of electric lighting—at any rate, as regards energy consumption—which is known at the present day." Mr. Hatfield was wise in incorporating the qualifying words, "at any rate as regards energy consumption," because, looked at from other points of view than energy consumption, there are users (such as the shopkeepers before mentioned) who would be disposed to question the statement. It is strange but true that the electric lamps that are the most efficient in energy consumption are the ones that give the most trouble; and those that give the least trouble are those that are the most extravagant in energy consumption. Mr. Hatfield does not simulate unconsciousness (as is a pretty and amusing habit of some electricians) of the existence of anything good in incandescent gas lighting, for he says "that the flame lamp comes at an opportune moment to enable electric lighting to meet the formidable competition of high-pressure gas lighting." When broad-mindedness of this kind is found in the writings of friends of the electrical industry, it always puts one in a respectful frame of mind, and creates a desire to know more of what such a man has to say. Well, having in view this "formidable competition," it is urged by Mr. Hatfield that practice and design of flame arcs should undergo as rapid an evolution as possible, and that the problem of providing mechanism suited to the peculiar conditions should be clearly understood. He admits that, at the present time, in this branch of the electrical business, things are in a transition state; and therefore, it may be suggested that while the lamps are *en route* to a more perfect state, shopkeepers and street lighting authorities would do well to pause, before spending money on them, to see whether that more perfect state is reached. There seem to be so many pitfalls in the road to perfection in electric lighting! The difficulties are substantial with which the electrical industry has to deal in producing the more perfect lamp. Mr. Hatfield mentions three: First of all, the rapidity of the consumption of the flame carbon as compared with the carbon in an ordinary type lamp; secondly, high prices and considerable fragility of carbons impregnated with metallic salts; thirdly, the copious evolution of metallic salt from the carbons from their burning, which endangers insulation, causes clogging of the mechanism and increased friction, and sometimes prevents half-burnt carbon ends making contact on switching on. These difficulties are so clearly put that they do not require elaboration to emphasize them.

There is perhaps nothing more admirable than candour in a writer; and we get it again in Mr. Hatfield when he tells us that a certain proportion of the increased efficiency of flame arc lamps is, no doubt, due "to the high reflecting power of the economizer, which is kept continually whitened by the calcium fluoride evolved from the carbons; and a certain *illusory increase in efficiency is gained by the unequal distribution of the light, which is a positive disadvantage in street lighting.* But, in the opinion of the writer, there is an actual increase in efficiency which is most probably due to some cause which our entire ignorance of the nature of the actions going on in the flame arc prevents our being able to explain." The foregoing is a little involved in construction; but what Mr. Hatfield means seems sufficiently plain. Some of his words—those italicized here—quite fit what we have been saying in the "JOURNAL" for a long time past, that there is much that is illusory in the flame arc lamp, and that the character of the light and its unequal distribution are positive disadvantages in street lighting. Reverting to the difficulties mentioned in the preceding paragraph, it is a great pity—or rather we suspect our electrical friends think it is so—that "progress" in electric lamp construction runs in the direction opposite to that which progress in invention should take, and usually does take. Progress should be towards simplification, but it cannot be said that it is the case with electric lamps. The organism of the flame arc lamps is not simpler than that of the ordinary arc; and the metallic filament lamp is not an advance in simplicity upon the carbon filament lamp. The short life of the chemical carbons of the flame arc lamps has necessitated the use of fairly long carbons to obtain a reasonable life; and carbon magazines (long the ambition of the electrician, but ever troublesome even for ordinary arc lamps) have again been tried. But if they could not be made successful with lamps using carbons without metallic salts, how much more difficult will it be to keep the magazines in good running order with the "copious evolutions of metallic salt from the carbons from their burning." Many electricians have put in these magazine lamps in lengths of streets the lighting of which is under their control. The recommendation was their own, their Committees accepted their word, the price has been paid, the worry is the electricians', and little they say about it to their Committees. Dignity compels silence; and so does their personal composure. The greater part of Mr. Hatfield's article is devoted to the explanation of a patent by Mr. Frank Lewis, whereby he has—it is hoped by the electricians successfully—overcome the use of the commonly used clockwork feed for carbons in flame arc lamps. It does not require a large amount of intelligence to see that if clockwork is undesirable in an arc lamp of the common type, in a flame arc lamp it is especially so.

It is impossible to keep off the question of public lighting for any great length of time. This is not our fault; it is the fault of those grumblers—and they are ubiquitous—who are constantly objecting to the cost and to the effect of electric lighting in the streets. Mr. Stapleton started the matter again in the Croydon Town Council the other day, by expressing the opinion that the arc lamps are not giving full value for their money. That is the difficulty. There are few places where they do give full value for money; and yet there are very few places where the electric light undertakings are municipally owned where the money received for the street lighting by electricity really pays the department. We could show Mr. Stapleton a good many examples of arc lighting in London, and quote the prices paid, which would convince him that what he experiences at Croydon is not unique. There is not the slightest question that Mr. Stapleton was speaking with moderation, because Alderman Lillico urged the taking of some "serious steps" in connection with the arc lamps. "Serious steps" look as though things were terribly bad. The Alderman is also impressed by the fact that the Council are paying, for lighting 17 miles of streets by electricity, as much as, if not more than, they are paying for lighting the whole of the remaining 127 or so miles of streets which are lighted by incandescent gas-lamps. Observe the variation in mileage; the equality in expense. The vast majority of the ratepayers live, move, and have their being in streets that a reunlighted by electricity. What does it profit the majority that a small minority should live, move, and have their being in streets lighted in a very costly and indifferent manner—that is to say, at a cost per annum about nine times more per mile than the cost of the gas-lighted streets of the majority, who, being the majority, have to pay the largest amount towards the lighting of the thoroughfares of the minority. It is an unjust world, and who will say it has not become more so with the advance of municipal trading in electricity? Defence at the Croydon Council meeting was attempted by Mr. Betteridge, who agreed that the charge of £17 per arc lamp was a large one; but, in extenuation, he remarked that, compared with the charges by other corporate bodies, it was a reasonable amount. Which is tantamount to arguing that two blacks make a white. Some corporate bodies, of course, do charge steeply; others do not charge enough to pay them. We have a suspicion that the Electric Lighting Committee at Croydon are not charging a paying price at £14 for flame arc lamps, including the chemical carbons, attendance, and so forth; and it would be interesting to have an opportunity of examining into the items making up the £14 charge. An average of £55 8s. per mile of road is paid for the incandescent gas lighting. That £55 8s. would only allow of four flame arc lamps (at £14 each) being put up in a mile of thoroughfare. So distributed, it would be instructive to see what sort of a job the lamps made of the lighting of the mile. One cannot, with large centres of illumination such as flame arcs, which do not diffuse their light well, have at the same time fairly uniform illumination and cheapness. It is of interest to learn, from a letter by Mr. J. W. Helps in a local paper, that the offer remains open of the Croydon and South Suburban Gas Companies (which was submitted some time ago) to light with gas free of charge for six months, for comparison with electric arc lighting, a selected section of the town in such

a manner as would represent an annual saving in cost to the Corporation on the lighting of the town equal to a rate of 1d. in the pound. What is it that keeps the Corporation from accepting this liberal offer and fair challenge?

If ever justification has been required for the careful scrutiny that has lately been given to electricity works under municipal management by Inspectors of the Local Government Board and others, it is furnished by the miserable muddle into which incompetence has brought the electricity undertaking of the Woolwich Borough Council. Sir Alexander B. W. Kennedy and the Local Government Board Auditor (Mr. A. Carson Roberts) have furnished the gruesome details which make no condemnation of the late administration at Woolwich too severe; and those details would, in several respects, apply more or less to many a similar concern under municipal control. There is Sir Alexander's deliberate opinion that serious mistakes were made in the erection of the Woolwich works; and he believes the undertaking can never be made profitable in two of the districts to which current has been carried. This shows that the Council have been either ill-advised in technical matters right from the start, or that, if the technical advice was good, then the amateur electricians forming the majority of the Council—for, of course, the old majority were all electricians, or thought they were—"improved" on the advice tendered to them. However that may be, the technical officers had no commanding power regarding finance. What has happened in that respect has been painted in vivid colours by Mr. Carson Roberts. The accounts have not shown the full amount of the losses, nor have the deficiencies by any means been dealt with in making the rates. The understatements of losses have increased; and they—the understatements—appear to have involved about £3000 per annum. The average charge for street lighting has been about 3½d. per unit for current alone, apart from other charges [compare this with the charge for power and heating]; while the corresponding charge in other parts of the Metropolis averages between 1½d. and 2d. per unit. Legally, under the Provisional Order, the Council should not charge quite 2d. per unit in the current year for public lighting; and so the reduction in income from this source this year should be about £1200. No charge at all has been made on the undertaking for office accommodation in the Town Hall; and no charge has been made upon it for the services of the Town Clerk, the Borough Treasurer, and their assistants. The outcome is that the Auditor calculates that the rate to cover the deficiencies in the revenue of the undertaking will range from 5d. to 8d. in the pound per annum. Then there has to be taken into account the coming burden of £18,000, instead of £12,000 per annum by loan service charge. The ratings in aid of the concern up to March 31, 1906, which amounted to a total of £20,164, have left arrears of deficiencies amounting to £9668. That is all bad enough; but in proportion, from the financial point of view, the facts are worse in connection with the trading in wiring and fitting installations, motors, &c. Both the Auditor and Sir A. B. Kennedy recognize this; and the latter recommends the discontinuance of this business. Sir Alexander also considers that it will be at least ten years before the undertaking can possibly make both ends meet; and this can only be done by a reduction of the costs of production and an increase in the price to the consumers. Truly a nice outlook for ratepayers and consumers alike! The reports on the subject are long ones; but it would pay every municipal authority to take them as a good example of how not to run electricity works, and as a guide to see whether in any respect the criticisms would apply to their own concerns; and, if they do, to set about mending them without delay.

A Welsbach Mantle in a Hydrogen Flame Burning in Chlorine.

In a recent number of the "Journal für Gasbeleuchtung," Dr. C. Killing describes an experiment in which he plunged an incandescent burner consuming hydrogen into an atmosphere of chlorine. It is, of course, well known that just as hydrogen burns in oxygen to produce water, so hydrogen will "burn" in chlorine, or chlorine "burn" in hydrogen, yielding hydrochloric acid gas. Dr. Killing connected a holder containing hydrogen by means of a rubber pipe to a length of glass tube bent at one end into the shape of a U. To the shorter limb he then fitted a steatite burner and an incandescent mantle (a "Baby" mantle) carried on an ordinary clay prop. The hydrogen was ignited and allowed to play on the mantle while the burner was in the air, and it was then plunged into a tall cylindrical glass vessel, open at the top, and filled with chlorine. In these conditions, though no metal was present about the flame, the mantle gave a greenish light of extraordinary brilliancy. At the end of the test, the mantle appeared to be wholly unchanged, and on analysis was found to contain no trace of either thorium or cerium chloride. The author considers his experiment to prove that when an incandescent mantle is used in ordinary conditions, the cerium oxide does not play any part as a carrier of oxygen; but it still leaves the question undecided as to the true reason for the high luminosity of the mantle, unless the reason is that the mantle is brought by the flame to a temperature which is not exceeded even in an electric lamp yielding the whitest light.

Mr. R. C. Pearson has joined Mr. Alexander Watson and Mr. Charles E. Murray on the Board of Wilson Carter and Pearson, Limited, of Birmingham.

OBITUARY.

MAGNUS OHREN.

We regret that it again falls to our duty to record the severance of another link connecting the present with the past of the gas industry. Last Thursday morning, Mr. Magnus Ohren passed peacefully away, at his residence, "Burleigh," Garlies Road, Forest Hill, in his 86th year.

Mr. Ohren came of an old Swedish family. His great-grandfather was a shipowner who settled in this country; his grandfather held an appointment under the Crown as Surveyor of Sloops; and his father was a wharfinger at Rotherhithe, where the son Magnus was born on Dec. 8, 1821. He was therefore an Englishman by birth, as he was in sentiment and disposition. In 1837, at the age of sixteen, his connection with the gas industry commenced by his being articled to Mr. Geddie Pearse, the Engineer-in-Chief of the British Gas Company, whose London works were in School House Lane, Ratcliff. He remained with the Company till 1846, when he went to Hamburg to assist in lighting the city with gas. On his return to England in 1850, he was re-engaged by Mr. Pearse. At that time the Company were short of storage room, and Mr. Ohren had an opportunity of watching the process of telescoping a small holder—a rather novel piece of engineering work in those days—by Mr. Wright (now Messrs. Westwood and Wrights). The works eventually became too small to meet the requirements of the district, and they were acquired by the Commercial Gas Company. Mr. Ohren passed into their service (he was the only officer taken over), and was appointed Superintendent of his old district as well as of Millwall. While with them, he carried out a very successful piece of work in the laying of a 10-inch main in East India Road, to afford a better supply of gas to Millwall from Stepney; thereby obviating the large capital outlay required for the erection of works at the former place, which had been in contemplation. The Crystal Palace District (now the South Suburban) Gas Company was formed in 1854; and the next year Mr. Ohren was appointed Manager of the works. He subsequently became Secretary, and discharged the duties of the two offices until 1865, when they were divided owing to the extraordinarily rapid growth of the undertaking. He held the secretaryship till the autumn of 1893, when, having reached his 72nd year, and his health being much impaired, he sent in his resignation. It was regretfully accepted by the Directors, and his son Charles, who had then been with the Company for 26 years, and was second in the office, was appointed to succeed him. At the spring meeting in 1894, the Chairman (Mr. Frederic Lane Linging) referred to Mr. Ohren's long connection with the Company, and expressed the regret of the Directors at the loss of his services, extending as they had done over a period of 38 years; and their proposal that these should be recognized by the shareholders by the grant of a retiring allowance of £500 per annum was supported by Mr. (now Sir) George Livesey, and acquiesced in with the utmost cordiality. During the time Mr. Ohren was with the Company, he witnessed a truly enormous increase in the consumption of gas.

In the ranks of the gas profession, Mr. Ohren was well known, alike from his technical and his financial connection with it; and he was very highly respected. He was admitted an associate member of the Institution of Civil Engineers on Jan. 11, 1859. He was one of the founders of the Society of Engineers, a fellow of the Chemical Society, and a fellow and one of the members of the Sanitary Institute. He joined the British Association of Gas Managers in 1864, was Acting President in 1870, passed into the Gas Institute, and remained a member till 1888. He joined the Institution of Gas Engineers which was formed in 1890, and was one of the Auditors; and on the amalgamation of the two bodies in 1903, he became a member of the new Institution. He was auditor of several gas companies.

Mr. Ohren was a prominent Mason; his career commencing in 1861, when he was initiated in the Britannic Lodge, No. 33, of which he became W.M. in 1872. He was a Founder and the first Secretary of the Evening Star Lodge, No. 1719, of which he was P.M.; in 1870 he was installed W.M. of the Frederick Lodge of Unity, No. 452, in the Province of Surrey; in 1880 he was appointed Grand Assistant Director of Ceremonies; and he was a Life Governor of, and had twice served Stewardships for, the three Masonic Charities. In addition to his labours in the cause of Masonry and Masonic benevolence, he was an active friend of the local charities of the district in which he resided, and was a subscriber to many others.

The funeral takes place to-day (Tuesday) at Ladywell Cemetery.

WILLIAM WINSTANLEY.

We regret to record the sudden death on the 15th inst., as the result of an apoplectic seizure, of Mr. William Winstanley, the Gas Engineer and Manager of the Newcastle-under-Lyme Corporation. He was engaged upon his ordinary duties of inspection in the town in the morning, and on his return home at midday complained of feeling unwell. Almost immediately afterwards he became unconscious; and on the arrival of two medical men they pronounced the case to be hopeless. He never regained consciousness, and died just after seven o'clock in the evening. Mr. Winstanley had had the management of the gas-works from the time of their acquisition by the Corporation (1881) from the

Newcastle-under-Lyme Gas Company, under powers obtained four years previously; and at the date of the transfer he had been in the Company's service for nearly six years. His business connection with Newcastle, in which he was held in very high esteem, therefore extended over a period of about 32 years. Originally his duties under the Corporation included the secretarial work of the Gas Department; but this was relinquished a few years ago. He was admitted an associate member of the Institution of Civil Engineers on Feb. 1, 1887; he joined the British Association of Gas Managers in 1875, passed into the Gas Institute, and eventually into the Institution of Gas Engineers. He had been a member of the Midland Association of Gas Managers from its formation—having attended the meeting called by the Provisional Committee to start the organization on Oct. 11, 1877.

The funeral took place last Tuesday, at the Newcastle Cemetery; and, in addition to the members of the family, it was attended by the Presidents of the Midland Association and the Manchester District Institution of Gas Engineers (Mr. Hubert Pooley and Mr. William Prince), many professional and private friends, the foreman (Mr. L. Shaw), the members of the staff, and most of the men from the gas-works, by some of the oldest of whom the coffin was borne to its last resting-place. The works were closed for the day, to allow as many as possible of the employees to attend the funeral, which was witnessed by a large gathering of sympathizing spectators. Deceased leaves a widow, three sons, and two daughters.

Mr. Charles Meiklejohn, the Secretary of the Midland Association, has sent the following appreciative remarks on the late Mr. Winstanley: "From the formation of the Association in 1877 to the day of his death, he was most regular in his attendance, and was ever helpful with his cheery support. He was elected a member of the Committee in 1898, and served in that capacity for three years. He never took a very active part in the technical work of the Association; but as a member of it he was always ready to assist his fellow-members with the records of his own experience, given in his own quiet way. This is one phase of the Association's work which is, I think, no less helpful than the more 'stereotyped' form of a written paper. I am sure I am but expressing the opinion of the whole of the members in saying that we shall greatly miss his kind and genial presence."

France and the world of science have alike sustained a great loss by the sudden death, under singularly distressing circumstances, of M. Marcelin Berthelot, the distinguished chemist, which took place on Monday last week. He was in his 80th year, having been born on Oct. 29, 1827. M. Berthelot was the virtual founder of the science of thermo-chemistry, and one of the most successful pioneers in synthetic chemistry; and his distinction as a philosopher, as a writer, and as a great citizen contributed to make his name one of the most justly renowned of the Nineteenth Century in France. He succeeded Pasteur in 1889 as Perpetual Secretary of the Academy of Sciences, was Minister of Public Instruction in 1886-7, and Minister of Foreign Affairs in 1895-6.

Many of our readers will learn with regret of the death of Mr. E. M. Pearson, the Chairman of Wilson Carter and Pearson, Limited, coal and coke factors and exporters, of Birmingham, which took place on the 14th inst. Early in life Mr. Pearson became associated with the coal trade, entering the offices of the late Mr. Wilson Carter, who as far back as 1848 commenced business at Birmingham and Wigan. Subsequently Mr. Pearson became the sole proprietor, and under his guidance the business was successfully conducted. In 1900 it was converted into a limited company, when Mr. Pearson, while still retaining a keen interest in its welfare, ceased, through failing health, to take an active part in the management. The concern is one of the most highly respected and most successful undertakings in the coal trade, and is extensively associated with the gas industry. Mr. Pearson, through his kind and genial disposition, had endeared himself to a wide circle of friends, and on the Birmingham Coal Exchange a general and profound expression of regret was manifest on the news of his death becoming known. He was a Vice-President of the Birmingham branch of the Coal Trade Benevolent Association from its inception. The funeral took place last Tuesday, at Packwood Church, Warwickshire, when a number of friends were present to pay their last respects to his memory.

On leaving the service of the Wrexham and East Denbighshire Water Company to take up a position as Collector under the Metropolitan Water Board, Mr. T. Hargreaves was presented with a handsome dining-room clock, subscribed for by the officials and men in the employment of the Company. The Engineer (Mr. F. Storr), in making the presentation, referred to the long time (fifteen years) Mr. Hargreaves had been in the service of the Company, and the high esteem in which he was held by all. He congratulated Mr. Hargreaves on being one of six selected from over a thousand applicants. It was with regret that they parted with one so loyal and zealous in the interests of the Company. He might add that the Directors at their last meeting passed a special resolution acknowledging Mr. Hargreaves' faithful services, and had given a practical expression of their appreciation by granting him an honorarium. Mr. Hargreaves, in thanking the subscribers for their gift, expressed the great regret he felt in severing old ties, but said the opening in London was one not to be missed.

THE RETURNS OF GAS TESTINGS IN LONDON.

We expressed the intention, at the close of some comments in the "Journal" for the 5th inst. (*ante*, p. 591) on recently published returns of gas testings in London, of making a further inspection of the results at an early date; and in view of the interest which our comments have aroused, we propose to take this opportunity to give a summary of the returns for the first two months of the year, and to offer some remarks thereon. We hope to give from time to time similar summaries of subsequent returns.

It may be well at the outset to indicate what is the scope of the testings here referred to. It will be remembered that the Metropolitan Gas Referees, in recent issues of their "Notification," have prescribed gas-testing places in the Metropolitan area as follows: For the Gaslight and Coke Company, 14 places; for the South Metropolitan Gas Company, 6 places; and for the Commercial Gas Company, 2 places. Of the 14 testing-places for the Gaslight and Coke Company, 3 are within the boundaries of the City of London, and are therefore controlled by the Corporation. We have at present no information as to the results of testings made at these three City testing-places. The remaining eleven testing-places for the Gaslight and Coke Company, and the eight places for the other two Metropolitan Gas Companies, are all under the control of the London County Council; and it is from the returns now issued weekly by the Council that we derive the information from which the appended summary is made. These returns are compiled under the authority of Dr. Frank Clowes, the Chief Chemist and Superintending Gas Examiner to the London County Council.

The returns now issued differ in several particulars from those sent out under the same auspices a few years ago. The provisions of the London Gas Act, 1905, entailed a great alteration in the conditions of gas testing in London. Formerly, all the testings made were "penalty" testings—*i.e.*, the gas company were liable to incur a forfeiture if the testing showed that the gas had not so high an illuminating power or so high a degree of purity as it ought to have had according to the Acts of Parliament or the prescriptions of the Metropolitan Gas Referees. These "penalty" testings included tests (1) for illuminating power in the "London" argand burner, (2) for pressure, (3) for sulphuretted hydrogen, (4) for sulphur otherwise present, (5) for ammonia. Now, however, there is another class of testings—viz., tests made merely for the purpose of affording information, and carrying with them no liability to forfeiture whatever the results may be. The "penalty" testings have been reduced to three, and two of the three are less exacting than those which they replaced. The illuminating power of the gas when burnt in the "Metropolitan" argand burner No. 2 is required to be not half-a-candle or more below the illuminating power prescribed; the gas must not exhibit any trace of sulphuretted hydrogen when tested in a prescribed manner; and the pressure at which the gas is supplied must not fall below a prescribed standard. If the tests made by the officials of the London County Council at the several testing-places show that the gas does not fulfil these three conditions entirely, the gas company are liable to incur a forfeiture. In addition to these testings, which may be made daily (Sundays included), there are three other testings, which, being only for the purpose of supplying information, may be made daily or less frequently at the option of the London County Council, but in any case not on Sundays. These testings are for (1) the illuminating power of the gas when burnt in a prescribed flat-flame burner, (2) the calorific power of the gas, and (3) the amount of sulphur other than in the form of sulphuretted hydrogen present in the gas. It will be noticed that the testing formerly made for ammonia no longer appears in the "penalty" or the "information" class.

The standard illuminating power with the "Metropolitan" argand burner No. 2, half-a-candle below which the average result of three consecutive days' testings may not fall without a forfeiture being incurred, is 16 standard candles for the Gaslight and Coke Company, and 14 standard candles for the South Metropolitan and Commercial Companies. A forfeiture is, however, incurred if the deficiency on any one day is one candle or more. The standard pressure at or above which the gas must be supplied, is 6-10ths between midnight and sunset, and 10-10ths between sunset and midnight.

This epitome of the regulations under which the gas supplied by the three Metropolitan Gas Companies is tested has been given because these regulations are scattered in various Acts and Notifications which have to be construed together in order to arrive at the regulations which are actually in force at the present day. Those not brought face to face with the conditions of gas testing in the Metropolis fail commonly to realize their true significance; and it is therefore hoped that this statement will be of service in setting out their salient features without reference to the mass of relatively unimportant details.

We may now pass on to consider the results of the testings, made under the regulations referred to, in the nineteen testing-places under the control of the London County Council during the months of January and February, or, to be precise, during nine weeks ending March 2. At each of three of the testing-places for the Gaslight and Coke Company, two different streams of gas are tested, so that this Company's supply is, in effect, tested at 14 different points (as well as at 3 places in the City of London). The

results of the "penalty" testings of illuminating power, made with the "Metropolitan" argand burner, show that, in the period under review, the gas supplied by the Gaslight and Coke Company has averaged a little over 16·6 candles, with a maximum result of 18·8 candles, and a minimum of 14·83 candles. The latter result, being over one candle below the standard, should involve the Company in a forfeiture, unless they are able to substantiate a plea of extenuating circumstances before the Chief Gas Examiner. The gas supplied by the South Metropolitan Gas Company has averaged about 16·15 candles, with a maximum result of 18·4 candles and a minimum of 14·3 candles. The Commercial Gas Company have supplied gas averaging about 15·2 candles, with a maximum of 16·8 candles and a minimum of 14·1 candles.

These figures are highly significant, and should be pondered well by gas undertakings who contemplate approaching Parliament for a reduction in their standard illuminating power and a revision of their testing clauses. The South Metropolitan Gas Company, who in 1900 obtained statutory powers reducing their prescribed illuminating power from 16 to 14 candles, had to concede, as a *quid pro quo*, a reduction of 2d. in their maximum price under the sliding-scale. The Commercial Gas Company followed suit by their Act of 1902. The Gaslight and Coke Company, however, dallied, and their statutory illuminating power remained at 16 candles when the London Gas Act, 1905, was passed, in virtue of which ultimately the "Metropolitan" argand burner No. 2 superseded the "London" argand burner No. 1 as the testing-burner. The result of this change of burners appears to be that the South Metropolitan Gas Company are now credited with supplying gas averaging well over 16 candle power, and are apparently—taking the evidence of these figures alone—now deriving little or no benefit from the dearly-bought reduction of their statutory illuminating power to 14 candles in 1900. The Company manufacture coal gas only; and it would seem that they have been unable advantageously to produce coal gas approaching 14-candle power under the new conditions of testing. The Commercial Gas Company, aided by their carburetted water-gas plant, have got down to an average of about 15·2 candles. But even so they can hardly be considered to be benefiting fully by the reduction of their standard illuminating power in 1902 to 14 candles. The Gaslight and Coke Company, having conceded nothing in their standard price under the sliding-scale, are fulfilling their more exacting statutory obligations with gas testing only half-a-candle above that of the South Metropolitan Company. Wittingly or not, the Gaslight and Coke Company have in this respect profited more than their smaller Metropolitan *confrères* by the legislation of the present century. It would thus seem clear that Provincial gas undertakings who have a prescribed illuminating power of 16 candles or less, should hesitate to concede anything on the standard price in consideration of a reduction of illuminating power. They might, in cases, be well advised to leave untouched their present prescribed illuminating power, and confine their efforts to obtaining the same testing conditions as the Metropolitan Companies. If they are supplying only coal gas, this would present itself as the politic course; but if they can dilute the coal gas with less highly illuminating water gas, they may secure some advantage from a reduction in the prescribed illuminating power. Pending some revolution in carbonizing methods, there seems little doubt that honest coal gas cannot be made to average less than 16-candle power when tested under London conditions. *Verb. sap.*

The results of the "information" testings of illuminating power in a flat-flame burner may be briefly noticed. The burner prescribed is Bray's No. 7 economizer (slit) fitted over a Bray's No. 4 regulator (union-jet). The average of the results of all the testings of the gas supplied by the Gaslight and Coke Company during the period under review is about 11·8 candles, or nearly 4·8 candles less than the average of the argand results. The flat-flame average for the South Metropolitan Gas Company is about 11·25 candles, or nearly 4·9 candles less than the argand average. Obviously little can be inferred from these results as to the relative merits for flat-flame lighting of the coal gas supplied by the South Metropolitan Gas Company, and of the mixed gas supplied by the Gaslight and Coke Company. Passing down, however, to the lower grade mixed gas supplied by the Commercial Gas Company, it appears that flat-flame users are at a serious disadvantage. The average of the results of the flat-flame testings of that Company's gas is about 9·45 or (say) $5\frac{3}{4}$ candles less than the argand average. Comparing only the two mixed-gas supplies, there is a difference of only 1·4 candles between the argand averages of the two Companies north of the Thames, but a difference of nearly 2·4 candles between the flat-flame averages. If, therefore, the flat-flame user has any right to be heard nowadays, his plea that the higher standard of illuminating power best meets his requirements must be granted to be well-founded.

The results reported of testings of calorific power are obviously the "net" values, and therefore almost certainly relatively more favourable to the supplies containing water gas than the "gross" values would have been. Nevertheless, the coal gas of the South Metropolitan Company shows the highest average—viz., $134\frac{1}{2}$ calories per cubic foot, with the mixed gas of the Gaslight and Coke Company only about $\frac{1}{2}$ calorie lower. The Commercial Gas Company's supply is, however, of considerably lower calorific value, averaging $127\frac{1}{4}$ calories per cubic foot. Again comparing only the two mixed gas supplies, the fall of 1·4 candles in argand illuminating power is attended by a fall of a little more than $6\frac{1}{2}$ calories in the net calorific power, or (say) of $4\frac{3}{4}$ calories per candle. No doubt this relation is affected to some extent by the proportion of water gas in the mixture. For some reason the London County Council have not seen fit to report the "gross" calorific power, or as a fact to state that the values reported are "net" and not "gross." In the gas industry "calorific power" without qualification is understood to be "gross;" and the returns as published may lead to an under-rating of the calorific value of London gas.

Passing on to the average amounts of sulphur in the gas supplied, it appears, as would be anticipated, that there is somewhat less in the mixed gas than in coal gas. The sulphur in the coal gas supplied by the South Metropolitan Gas Company has averaged about $46\frac{1}{2}$ grains per 100 cubic feet, with a maximum result of 84·1 grains and a minimum of 22·0 grains. That in the mixed gas has averaged $40\frac{3}{5}$ grains per 100 cubic feet for the Gaslight and Coke Company, and 38 grains for the Commercial Gas Company; the maxima being 62·6 and 57·1 grains, and the mimima 10·6 and 21·9 grains respectively per 100 cubic feet. We need not now discuss the import (if any) attaching to these figures; but they should be borne in mind when questions arise as to the amount of sulphur which remains in gas which is not purified by means of lime. It would appear that the amount of sulphur in coal gas has increased with the increase in heats of carbonization, since the tests made in London in 1870–73 showed considerably lower results—*i.e.*, an average of $33\frac{1}{3}$ grains per 100 cubic feet for the South Metropolitan Company's gas, with a maximum of 44·3 grains. In Butterfield's "Chemistry of Gas Manufacture," 1896 edition (p. 110), the carbon disulphide and other sulphur compounds in coal gas freed from sulphuretted hydrogen are stated to range from 36 to 46 grains per 100 cubic feet. Thus the greater part of the increase in the sulphur in coal gas appears to have occurred with the introduction of high carbonizing temperatures between 1873 and 1896; but even since the latter year there seems, by the figures now published, to have been an appreciable increase, probably owing to the yet more thorough exhaustion of the gaseous products from the coal which is now accomplished. It is improbable, however, that any further appreciable increase in the amount of sulphur in coal gas will take place. In any case it would be unsafe for a gas undertaking making coal gas only to set out to supply gas always containing less than 50 grains of sulphur per 100 cubic feet on the average of a month's working, or (say) 100 grains as a maximum on individual testings, unless it is prepared to revert to the use of sulphided lime in the purifiers.

The presence of sulphuretted hydrogen in the gas has not been recorded against any of the three London Companies during the two months. As to pressure, it has been maintained well above the penalty limit. The average for the Gaslight and Coke Company has been 3·1 inches; for the South Metropolitan Company, 2·6 inches, and for the Commercial Company, 3·4 inches. The testings of pressure are made on the street-lamp columns.

Scottish Junior Gas Association.

The members of the Western District Section of the above-named Association paid a visit last Saturday afternoon to the Philpstoun Oil-Works of Messrs. James Ross and Co., at Falkirk. The party numbered about 35, and they were received by Mr. A. H. Crichton, the resident partner, who described the arrangements proposed, which included a descent into the mine for those who cared to go. A large number of the members availed themselves of the opportunity thus afforded of inspecting underground workings; and both there and on the surface three hours were very pleasantly, and, we believe, profitably, spent. The Directors of the Linlithgow Gas Company and their Manager (Mr. R. M'Nair) being the Oil Company's nearest neighbours connected with the gas industry, were invited to join the party, At the conclusion of the inspection, the visitors were entertained at "high-tea" in a recreation hall which the Company have erected in the village for the benefit of the workmen, and which was used for the first time. We shall take an early opportunity of noticing the visit at greater length. Meanwhile, our readers may be referred to the account of the visit given in "Notes from Scotland."

Reduced Railway Fares for the Institution Meeting in Dublin.—We learn from Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers, that the Associated Railway Companies have consented to issue to members attending the Dublin meeting, and to ladies accepting the invitation to the reception, &c., return tickets from any station in the United Kingdom available from Friday, the 14th, to Tuesday, the 25th of June, at a fare-and-a-quarter for the double journey. These tickets will be issued on giving up to the clerk, at the time of booking, vouchers signed by Mr. Dunn, and which will be obtainable on application at the office of the Institution, No. 39, Victoria Street, S.W., on or after Monday, the 3rd of June. One voucher will be necessary for each railway ticket required. Return tickets, available to return on the same day or on the following day (tickets issued on Saturday being valid until Monday), will also be issued from Dublin to places not more than 50 miles distant, at a fare-and-a-quarter (with a minimum of 1s.), on production of the card of membership at any of the booking offices of the various railways in Dublin. Members are reminded of the necessity of securing their rooms without delay; and they may be referred to the paragraph which appeared in the "Journal" last week (p. 747).

THE ILLUMINATING ENGINEERING SOCIETY AND ILLUMINATION NOMENCLATURE.

REFERENCE has been made from time to time in these columns to the work of the Illuminating Engineering Society (U.S.A.), which has just completed its first year of existence, and has now five sections and a total membership of 815.

The President, Mr. L. B. Marks, in giving his report at the annual meeting held in January last, restates and enlarges upon the *raison d'être* of the Society. He says that questions concerning the generation and distribution of electric current and of gas for lighting purposes had in the past received most careful attention. But the problem of obtaining the best illuminating results from these sources had been neglected, and it was for the discussion and solution of this and like problems that the Society had brought together at their meetings electric and gas engineers, architects, designers of globes, reflectors, and fixtures, oculists, chemists, physicists, manufacturers of lighting apparatus, and representatives generally of every field of work in which the question of illumination played the least part. In the discussions and collection of data, good work had been done; and the report claims that advances in the art of illumination had been inaugurated that would otherwise have been practically impossible. The President remarks that the Society had studied, among other things, the type of lamp, the size of light unit, the location and character of fixture, and the kind of globe or reflector which may be best suited to meet the demands of individual conditions of lighting. One of the most important topics dealt with was the need of reducing the intrinsic brightness of light sources, and particularly of such sources as were necessarily within the ordinary field of vision. Mr. Marks instances in the latter connection one case of a post office where a change in this respect allowed some members of the staff to dispense with eye-glasses.

Readers of papers on general illumination must have been struck by the increasing and confusing use of different terms to describe lighting effects; and they will therefore appreciate the President's remarks as to the adoption of definite nomenclature and standards for the proper systemization of illuminating engineering. He says: "At the present time our terminology is at best crude, and very often we are unable to avail ourselves of the benefits of valuable work done by others, because the terms used in public reports of such work are open to misinterpretation. To secure uniformity, the co-operation of the members of the lighting fraternity, not only of this country but of foreign countries, is necessary. Much has already been done by Committees to bring about the standardization desired." The President followed these remarks with an announcement as to the appointment of an International Committee of the Society.

Mr. Marks had at the previous meeting of the Society made reference to the necessity of a nomenclature which all could understand and accept; his remark being induced by the terminology used in Mr. P. S. Millar's paper on "Location of Lamps and Illuminating Efficiency" (as briefly abstracted in the "JOURNAL" last week, p. 740). In this paper, the author had spoken of the efficiency of the lamps (electric) as illuminators as being expressible in "lux per watt;" going on to say that the term "lux per lumen" denoted the efficiency of the illumination irrespective of the efficiency of the lamps. This term he re-defined as the ratio of the illumination to the flux of the light. It was also stated that other expressions—such as "lux per candle power" and "lux per square foot of floor space"—were frequently used in practice. Mr. Millar, in the course of his paper, makes fairly extensive use of the terms "lux" and "lumen," both in the text and the tables. Well might one member honestly confess to being "lost and tangled up" in these terms, and Dr. Bell admit that no apology was necessary for not being familiar with this terminology.

In the use of any nomenclature, consideration should be paid to simplicity, easy comprehension, and legitimate derivation from existing and current expressions. To keep to the question of lighting effect, this is a matter with which illuminating engineers and the general public are equally concerned. Technicians may wisely or unwisely adopt whatever terms they like to describe the laboratory or intrinsic value of any lighting source, be it by mean spherical or hemispherical intensity, by horizontal or angular light rays, or by Mr. Millar's phrase "lumen" as indicating total flux. The customer, however, who requires effective illumination wants it described in plain language, and by terms which can readily be interpreted by knowledge which he already possesses. He is accustomed to measurement in feet, and has some idea of the light given by a candle, and to talk of lighting effect in foot-candles is to talk of something comprehensible, or at least explainable. This is the more reasonable when one remembers that the "candle" is not only the generally used and legal standard in English-speaking countries, but one which is likely to remain in force for many a long year. It would be idle to suggest that it is the best, for this has still to be determined.

The International Photometric Committee, who met at Zurich in 1903, discussed a paper, read by Dr. H. Bunte, on "Technical Standards of Light." The author came to the conclusion that, without discussing the faults of the various standards in use—the Hefner lamp (= 0·877 English candle), the English sperm candle, the German paraffin candle (= 1·05 English candles), the Harcourt 10-candle pentane air gas lamp, and the Carcel lamp (= 9·53 candle)—the Hefner unit commended itself as the most useful. The English equivalents of the various standards, as stated by Dr. Bunte, are given above in parentheses. The Committee, after some discussion, provisionally accepted the values given by Dr. Bunte in his paper, and passed resolutions that comparative photometric testings should be made in Germany, England, and France, for the purpose of establishing the ratios subsisting between these standards. Attention was chiefly to be paid to the Hefner, the Harcourt, and the Carcel lamp.

It will be noted that the parliamentary standard candle is in value the mean of the German candle and 0·1 Carcel; and if, as Professor Lewes remarked at the Zurich meeting, some photometrists in England incline, and perhaps with reason, to the belief that the Harcourt pentane standard is equivalent to 9·8 rather than 10 sperm candles, this value approximates to the average of all the units already referred to. The candle also is nearly exactly $\frac{1}{20}$th of the once suggested Violle platinum unit. A comparison of the Harcourt, Carcel, and Hefner lamps has since been made by Parisian photometrists, and recently submitted to the French Academy of Science, with the result that, taking the Harcourt unit as 10 candles, the mean of the Carcel and Hefner equivalents works out respectively at 9·96 and 0·931 English sperm candles (see *ante*, p. 23).

These figures—obtained by inter-testing, and without direct reference to the primary candle standards—are somewhat different from those already given. Assuming the percentage of experimental error in each series of tests to be negligible, the later tests suggest some corroboration of the opinion that the Harcourt standard is in value slightly under, rather than exactly equal, to 10 English sperm candles. This perhaps is a point for further investigation. In any case, it may be conceded that the difference is too small to prevent the continued employment of the Harcourt as a good and useful English standard. There is, too, a distinct gain in the fact that the Harcourt and the Carcel are, according to the Paris tests, to all intents and purposes, identical units—being in value 1·000 and 0·996 respectively.

These standards, considered as one, may well serve, by the law of majorities, for International purposes; the Hefner unit, unless adjusted to suit, being correlated by some definite factor disclosed by agreed and approved tests. In the meantime, it must be felt that our own units are fairly serviceable standards; and until something definite is universally agreed, it is to be hoped that English writers will keep to English phrasing. It is certainly difficult to see what can be gained by the use of such an expression as "lux," meaning "bougie metre" (= ·0845 cubic foot) and based on a foreign standard and linear measurement, unless these are also to be adopted. Mr. Millar's nomenclature is, in other respects, contradictory in character. He speaks of the lamps tested as being of 16 or 32 candle power, as the case may be, and the height of the fixtures in feet; but, in dealing with illuminating effect, he phrases his results in "lux," or, in other words, bougies and metres.

Little need be said now about the work which the American Society's International Committee on Standards and Nomenclature may do. This is beside the question of present terminology, with which no great difficulty can for the time being be experienced. As Dr. Louis Bell said in the discussion, the whole art of gas lighting, which was the whole art of illumination up to a few years ago, was built on the basis of candles and foot-candles; and until there is some reason to abandon this basis, it would seem the part of wisdom to put our papers and discussions in a form easily translateable into these common terms. The Committee consists of the following members of the Illuminating Engineering Society: Dr. A. C. Humphreys (Chairman), Dr. L. Bell, Professor A. Blondel, Dr. Hans Bunte, Mr. L. B. Marks, Mr. J. W. Howell, Dr. E. P. Hyde, Dr. A. E. Kennelly, Professor Vivian B. Lewes, Dr. E. L. Nichols, Dr. F. Schniewind, Dr. C. H. Sharp, Mr. W. D. Weaver, and Mr. J. G. Woodwell (Secretary).

The international character of the Committee is obviously limited by the comparatively small number of foreign members, but is not inefficiently represented by Professor Lewes (Greenwich), Dr. Bunte (Carlsruhe), and Professor Blondel (Paris). It is to be expected that in any work undertaken the Committee will seek the co-operation of other European photometrists.

The remainder of the President's report deals with matters of organization. In order to distribute as equitably as possible the benefits and privileges of membership, the Society are prepared to form sections in any city or locality in which the local membership is fifty or more. Papers accepted for presentation are submitted to all the sections alike both for reading and discussion. The Council of the Society are generally in a very hopeful frame of mind, and are encouraged by the fact that the membership is showing a healthy and fairly uniform increase.

Tar Mortar.—A recent number of the "Annales des Ponts et Chaussées" contained a description of this material. The constituents are sand, cinders from factories (containing clinkers but not large lumps), and tar from pit coal. The proportions are about $2\frac{3}{4}$ bushels of sand to $3\frac{1}{8}$ gallons of tar. The mixture is prepared like ordinary mortar. The sand is formed into a heap, and a well made in its centre, and filled with tar. Then all is mixed several times with a spade until the tar and sand are homogeneous. At the place where it is to be used, it is simply applied in a coat of the requisite thickness, beaten down, and, if possible, rolled; sand being sprinkled over as on bitumen sidewalks. To cover 12 square yards, $8\frac{1}{4}$ bushels of mortar composed of sand or cinders with 11 gallons of tar suffice.

SMOKELESS FUEL FROM COAL.

In the "Manchester Guardian" last Tuesday, Dr. J. Grossmann, F.I.C., dealt further with the above subject, to which reference was made in the "Journal" which appeared that day (p. 741).

The author began by pointing out that the enormous development which has taken place within the last fifty years in the chemical and allied industries is greatly due to the utilization of bye-products; and that among those which have obtained the greatest benefit therefrom are those connected with the distillation of coal. He had already shown that the most probable method of obtaining a smokeless fuel would consist in subjecting coal to a similar process; and he thought, therefore, that if the characteristics of the older analogous processes and the points which make them specially remunerative were studied, it would be possible to form fairly accurate deductions with regard to the financial prospects of the manufacture of smokeless fuel. He then went on to refer to the distillation of coal for the production of illuminating gas, and showed that while a ton of coal heated in retorts to a temperature of from 1400° to 1700° Fahr. yields rather more than half-a-ton of coke as a residual, it is of poor quality, the price obtainable for it is considerably less than that paid for the coal, and the revenue derived from it, taking into account the shrinkage in quantity, only amounts to a fraction of the initial expenditure. At the same time, the manufacture and supply of gas produced highly satisfactory results, due to the crude gas containing substances of commercial value which could be removed without detriment to the illuminating power. The chief of these was tar, the practical utilization of which was one of the greatest triumphs of modern chemistry. Besides tar, another valuable substance might be recovered from the crude gas, and this was produced from the nitrogen contained in coal. Nitrogen itself was a substance of no value; but combined with hydrogen in the form of ammonia it was worth £50 per ton. If in the distillation of coal it were possible to convert all the nitrogen it contained into ammonia, the value of the latter would come to 15s. per ton of coal, and would alone fully pay for its cost; but Dr. Grossmann pointed out that no means are known to achieve such a result. Still more extraordinary, he said, were the financial results obtained when making high-class coke by modern methods.

The author next proceeded to deal with the question of how far, and by what means, an industry aiming at the production of smokeless fuel could furnish results approaching those of gas and coke making. He said the starting-point of the manufacture was the same—namely, coal; the ultimate product smokeless fuel—a product standing practically between coal and coke. If the substances which produce smoke were driven off, the quantity of smokeless fuel obtained would be so much less in weight as would correspond to the weight of the volatile matter which had been removed; and this, assuming that the residual fuel were sold at the price of the original coal, would have to be worth a great deal more than the corresponding weight of coal in order to pay all expenses and yield a profit. The profits might be considerably increased if only it were possible to use a low-priced coal or slack, and obtain from it a fuel which could be sold at the price of high-class coal. In that case, "the industry might be carried on profitably, even without the help of bye-products;" and if these, of a remunerative nature, were recovered as well, the author expressed the opinion that it would be "very similar to that of modern coke-oven works."

In regard to the production of this smokeless fuel, Dr. Grossmann said the main difference in manufacture would be in the temperature of distillation. On this point he said:

> At the white heat which is maintained in the coke-ovens, all the available hydrogen is driven off from the coal; and the residuum, being practically free from it, assumes the character of coke. In manufacturing smokeless fuel which shall still exhibit the characteristics of coal, it will be important to regulate the operation in such a manner as to leave sufficient hydrogen and oxygen in the residual product; and in order to effect this, it will be necessary to carry on the distillation at a comparatively low temperature and over a short time. Under these conditions, the tar produced will not only be less in quantity but also different in quality from that produced in gas and coke works, and we have at present no data to determine its value. As regards the quantity of ammonia which might be recovered at a low temperature, we are even more in the dark.

He concluded by pointing out that the object of his articles had been to explain, both chemically and financially, the possibilities of a new industry which indirectly aims at the solution of the important problem of the purification of the atmosphere, in which all are interested.

In connection with the foregoing, it may not be uninteresting to reproduce the following remarks, contained in the current number of the "Iron and Coal Trades Review," on the process to be employed in the manufacture of "Coalite."

> In regard to the process to be employed in the manufacture of "Coalite," we understand, from private information, that the reports to which we have previously referred are not quite correct in some particulars. It appears more likely that the coal is treated with superheated steam, and the Company are said to rely very largely for the success of their undertaking upon securing as a bye-product petrol instead of tar. If it be true that from 4 to 5 gallons of the latter, at 1s. or more per gallon, can really be extracted from each ton of coal, as it is suggested, and the quality is good, this particular part of the scheme might be profitable enough. Such a claim would be likely to meet with some incredulity. In any case, the process of manufacture, as a whole, bids fair to be an expensive one, and may perhaps turn out to be more costly when operations are commenced on a commercial scale at the works which it is stated are to be erected at Trafford Park than has been apparent from the results attained by the experimental plant at Wolverhampton. Superheated steam is not the least troublesome of agents to employ; and whereas the actual manufacturing costs of coke are (say) about 1s. 6d. per ton, those of "Coalite," it is calculated, will be at least half as much again. In regard to competition with coal, it will, of course, be the manufactured article trying to force a way into the market against the raw material; and unless the expected profits on petrol prove to be so good that "Coalite" can be sold at a very low price, it may not be an easy matter. Moreover, it must not be forgotten that the new fuel is stated to contain only about 10 per cent. of volatile matter, and it is therefore difficult to light. This is a serious matter as far as its application to household purposes is concerned, while unless it is really cheaper in the long run than ordinary domestic coal, people are not likely to burn it simply because it is smokeless, or nearly so, unless the smoke abatement enthusiasts succeed in getting a Bill passed in favour of the movement, and that is very unlikely just at present. . . . Upon the data available, it is not possible to form any very definite views as to the Company's prospects; but if the reports be true which are current as to the enormously inflated prices at which shares are changing hands, we should hardly regard as latter-day Solomons those investors who are putting their money into an untried invention on such terms.

STAINES RESERVOIRS COMMUNICATION WORKS.

The Fortis Green Reservoir.

Some of our readers may remember that the scheme of reservoirs at Staines devised by Messrs. Walter Hunter and R. E. Middleton, MM.Inst.C.E., and carried out by a Joint Committee composed of the Grand Junction, New River, and West Middlesex Water Companies, provided for the taking of the water by the respective Companies at works in the neighbourhood of Hampton. Those of the New River Company are situated at Kempton Park, whence a pumping main runs to Cricklewood, a distance of 13½ miles. From this point the water is pumped through a 42-inch main a further distance of 3½ miles to the Fortis Green reservoir, from which it will afterwards be conveyed by gravitation in a 30-inch main to the distributing mains of the New River district at Hornsey. These works are now, of course, under the control of the Metropolitan Water Board. The Chief Engineer of the Board (Mr. W. B. Bryan, M.Inst.C.E.), being the President of the Junior Institution of Engineers, afforded the members an opportunity last Saturday afternoon of inspecting the reservoir, the capacity of which will be 10 million gallons, and its depth 17 feet. A central division wall, extending up to a level of 6 feet below the top-water line, will divide the reservoir below that level into two equal parts. The floor will be of concrete, the walls and piers of brickwork, and the roof of brick-arching, with concrete filling to the spandrils, and covered with asphalte. The structure rests upon a thick bed of London clay, and is made water-tight by a wall of clay puddle extending all round the outside of the walls, and carried well into the clay below. The whole will be covered with earth and be thoroughly well drained; and the top and slopes of the embankments will be turfed. The floors have a fall towards the southern end, along which a drain channel will be formed with an emptying pipe for clearing the reservoir when necessary. For convenience of sweeping out, there is in the floor between adjoining bays of arching a brick partition a few inches in height. To prevent mischief in case of over-pumping, an Appold overflow is provided. This ensures that as soon as the water has risen to a certain height above the lip of the overflow, the surplus shall be very quickly drawn down by syphon action to the proper level. The sides of the trenches that have been excavated for the main walls, and which are 21 feet in width, are supported by means of horizontal timbers, 11 in. by 3 in., held up in sets of four by vertical walings 12 in. by 6 in., kept apart by struts of like size. By this method the face of the clay is firmly retained in place, and has no likelihood of being affected by external moisture. Considerable lengths of 42-inch and 48-inch diameter brick culverts have to be constructed to carry the surface drainage which now traverses the site by means of ditches. The whole of the works were designed by Mr. Joseph Francis, M.Inst.C.E., who was Engineer of the New River Company, and are being constructed under his supervision.

A new recorder for carbon dioxide has been invented by Mr. A. Bayer, and is now being manufactured by Mr. Julius Pintsch, of Vienna. The gas is drawn from the flues by a water-jet air-pump, and is cooled before being measured for the actual test. The absorption of carbon dioxide is obtained by means of moistened caustic lime, and the residual gases are again cooled to a standard temperature before measuring, so as to ascertain the contraction in volume due to absorption. The results are recorded on a revolving drum by means of vertical lines exactly as in the Ados recorder, and samples can be tested at six-minute intervals. The measuring vessels of the apparatus are filled with paraffin oil, and all the parts are constructed of thin sheet metal. The only attention required is the charging of the box holding the caustic lime, and the changing of the sheet on the recording drum.

SOUTHERN DISTRICT GAS ASSOCIATION.

The Annual Meeting of the Association was held last Thursday, at the Hotel Cecil, Strand. There was a large attendance of members. The Retiring President (Mr. F. W. Cross, of Lea Bridge) occupied the chair at the opening of the meeting.

Confirmation of Minutes.

The minutes of the proceedings at the last meeting were taken as read, and confirmed.

Annual Report of the Committee.

The President then submitted the annual report of the Committee, which, having been circulated, was taken as read.

The Committee in the report reviewed the work of the year, which embraced "events of unusual interest and importance." One of the interesting features of the year was the presentation, at the annual meeting on March 8, of a silver tea and coffee service to Mr. J. W. Helps, upon his retirement from the dual office of Hon. Secretary and Treasurer. Alluding to this interesting event, the report said:

In making the presentation, the President, Mr. F. W. Cross, of Lea Bridge, referred in terms of warmest appreciation to the value of Mr. Helps's services to the Association during the long period of eighteen years, and claimed that his qualities of mind and heart had made him a power for good in the life of the Association, and had won for him the esteem and regard of the members.

The President was followed by several members, who alike testified to the unique position and influence which Mr. Helps had occupied and exerted in the Councils of the Association during so many years.

Mr. Helps, in a very felicitous reply, spoke of his love for the Association, of the benefits he had himself derived from membership, of his pleasure in the work he had been privileged to do for the Association, and of the kindness and friendship shown to him by members, and concluded with a heartfelt expression of thanks for the gift and for the sentiments which had prompted it.

After the references to the proceedings at the meetings, the report continued—

The most important feature of the work of the Association during the past year has been the issue of the Committee's final report in connection with the Naphthalene Inquiry. The Committee are confident that members generally share their keen regret and disappointment at the premature termination, from lack of funds, of an investigation entered upon with the object of co-ordinating, by practical tests and experiments in gas-works, the widely divergent views, theories, and practice obtaining in connection with the naphthalene difficulty. The Committee believe their work has been the means of shedding further light upon this obscure problem; and they are confirmed in this view by the favourable reception which has been given to their final report, both at home and abroad. It is further a matter of great satisfaction to record that the work which the Southern Association has been obliged to relinquish is being continued by professional brethren in America and Germany, who have expressed their appreciation of the assistance which the information contained in the report will afford them in their further investigation.

Ten names have been added to the roll of membership, five members have resigned, six have become disqualified, and two members—viz., Mr. J. Wadeson, an original member of the Association, and for 45 years Manager and Engineer of the Windsor Royal Gas Company, and Mr. C. B. West, of Vauxhall, have passed away; leaving a total of 167 members, as compared with 170 at the end of 1905.

The balance standing to the credit of the Association at the commencement of the year was £105 19s. 3d. The receipts have amounted to £84 10s. 6d. and the expenditure to £95 8s. 9d.; leaving a balance of £95 1s. to carry forward. The usual copies of the Reports of the Gas Associations were presented to the members; and these absorbed a sum of £43.

In concluding, the Committee feel that the best thanks of the members are due to the President and Hon. Secretary for their services to the Association during the past year.

The Hon. Secretary (Mr. A. F. Browne, of Vauxhall) said he desired to call attention to the last paragraph but one of the report. It would be noticed that, at the beginning of 1906, the balance to the credit of the Association was £105 19s. 3d., whereas at the end of the year the balance had fallen to £95 1s. He should be sorry if it was thought that the Interim Secretary had been extravagant; and therefore he wished to state that practically the whole of the difference of £10 18s. 3d.—that was to say, £8 16s. 4d.—was expended in connection with the printing and issuing of the Naphthalene Report of the Association. The £8 16s. 4d. was so near the sum that constituted the difference, that he thought it unnecessary to say anything more.

Mr. T. Berridge (Leamington) considered the report an excellent one. The work that had been done for the gas industry generally was altogether admirable.

Mr. J. Terrace (Tottenham) seconded the motion, which was unanimously carried.

Losses to the Gas Industry—The Late Mr. Sugg and Mr. Young.

The President remarked that the members would have noticed in the report an allusion to the loss by death of two members—Mr. James Wadeson and Mr. C. B. West. But since the report was prepared, they had (the Association and the gas profession generally) suffered very much by the loss of two members of the profession—Mr. William Sugg and Mr. Young. He would ask Mr. Hunt to make a few remarks with reference to Mr. Sugg.

Mr. Charles Hunt (London) said it was his melancholy duty to give some expression to the feelings that he was sure animated them all with regard to the great loss the industry had sustained by the death of Mr. Sugg. He (Mr. Hunt) had been selected presumably for this office because, of all those present, he might perhaps lay claim to as long a term of years as anyone during which he had the honour and the pleasure of the acquaintance of Mr. Sugg; and, moreover, he felt he could appreciate as well as any present the great work that Mr. Sugg had done for the industry. Scarcely a movement had taken place in the development of gas in which Mr. Sugg did not play a prominent part. He (Mr. Hunt) need not refer to all the good work Mr. Sugg performed for the industry. He could only express the hope that, when the time arrived, each of them might be able to leave behind him at any rate a part of similar good work. He moved that a vote of condolence be passed to Mrs. Sugg and the family.

The motion was endorsed by the members silently rising in their places.

Mr. A. F. Browne said he was sure it was with feelings of the greatest regret that they learned recently of the death, after a protracted illness, of Mr. William Young, who had been such a good example, he might say, in two directions during the course of his long and useful life. As they knew, Mr. Young commenced his career in a gas-works; but he soon left gas-works and devoted his attention to the shale-oil industry. There he rapidly made his mark. Mr. Young had a mind so constituted that he must get to the bottom of things; and he applied himself so constantly to the theory as well as to the practice of the work in which he was engaged that his name became almost a household word not only in regard to the shale-oil industry, but in a great measure in connection with the gas industry. He (Mr. Browne) thought they would all agree that Mr. Young's writings and teachings were of the greatest value to the members of the gas profession; and he must personally say that there had been no writer upon the matters Mr. Young so ably discussed in whose work he had taken a greater and keener delight. Mr. Young was, he (Mr. Browne) was sure, looked up to with great respect by his colleagues in both industries; and he supposed that now Mr. Young had gone, they could say that the individual in this country who knew most about naphthalene had passed away. He seemed to have investigated the subject, and to have arrived at the true science of it many years before the great majority of gas engineers. And though there were others who had followed well in his footsteps, and carried on his work, the name of Young must always be more particularly associated with the naphthalene controversy in this country than that of any other man. It was not long ago, though Mr. Young had retired from work and was in ill-health, that he was good enough to assist one of their members—Mr. Thomas Glover, of Norwich—and Mr. Samuel Glover, of St. Helens, in the preparation of a paper and drawings on vertical retorts; and his knowledge of the shale-oil industry enabled him to make a very valuable contribution indeed to the subject. He had not, unfortunately, lived long enough to see the vertical retort he had especially favoured carried into practical operation in gas-works. He (Mr. Browne) merely alluded to this fact, because it showed how active Mr. Young's mind remained to the last. Every man engaged in the gas industry, he was sure, felt he had lost a personal friend, and one from whom he had received many lessons of the greatest value. He moved that a vote of condolence with the relatives of Mr. Young be passed by the members.

Dr. H. G. Colman (London) said he should like to associate himself with Mr. Browne's references to Mr. Young. To anybody who had been engaged on any question connected with naphthalene, his death must have the effect of a personal loss. He thought it would be universally agreed, as Mr. Browne had said, that to Mr. Young more than to any other single individual, the elucidation of the naphthalene problem was due. His papers, published in conjunction with Messrs. Samuel & Thomas Glover, laid clear the principles underlying the removal of naphthalene from gas; and the practical applications they brought about had formed the basis of all further work on the subject. Though perhaps Mr. Young's work on naphthalene was that which was most familiar to gas managers during the past ten years, it was really only a small side-issue of his work, which extended over an extraordinarily wide area—an area covering the large problems of distillation of both coal and shale, the fractional distillation of oils, the recovery of ammonia, and much else. It was granted to few men to have achieved so extensive a technical success over so wide an area as Mr. Young. When the history of the progress of the gas and allied industries during the last half-century came to be written, the name of William Young would hold a high position in the record. Mr. Young's papers were very numerous; and there was hardly one that did not contain much information of great value. He trusted that the proposed reprint of Mr. Young's papers would be carried into effect by the North British Association. This would be a fitting memorial to Mr. Young, and would stimulate others to follow in his footsteps in the work to which his life had been devoted.

The vote was passed by the members rising.

The New President.

The President said it was with regret that he had now to vacate the chair; but it was a pleasure to place in it the new President of the Association—Mr. Harold W. Woodall, of Bournemouth. He was sure they would derive great advantage from Mr. Woodall's presidency. Personally, he looked forward to the coming year with feelings of great pleasure. Mr. Woodall was now about to explain to them some of his work with the vertical retort. So far as he (Mr. Cross) was concerned, he was half-way between the horizontal and the vertical, but he had not yet reached the 45° of Mr. Love. He was sure the members would all join him in giving a hearty welcome to Mr. Woodall.

Mr. H. W. Woodall took the chair amid the cordial greetings of the members.

The President said it was his pleasant duty to propose a vote of thanks to the retiring President. The past session would always be an important one in the annals of the Association, in that it brought to a close the work of the Naphthalene Committee, and included other notable events, which were dealt with in the annual report. No Association could have had a better or more genial President than Mr. Cross had proved to be, nor one who had given himself more whole-heartedly to the work.

Mr. A. Dougall (Tunbridge Wells) seconded the motion, remarking that the members all knew how very heartily Mr. Cross had thrown himself into the work connected with the office of President. They were all much obliged to him for having presided so well over their deliberations; and they gladly thanked him for so doing.

The motion was cordially passed.

Mr. Cross, in reply, thanked the members heartily for this expression of their feelings for the services he had rendered. It had been to him a work of great pleasure. He was quite sure that he had received more instruction during his occupancy of the Chair than the members had received from him. It was a pleasure to do anything to further the work of the Association; and he trusted that the little he had done in the course of the year would bear fruit in the future.

Additions to the Roll.

Mr. G. W. Anderson, of Westminster, and Mr. G. M. Gill, of the Poplar station of the Commercial Gas Company, were unanimously elected to membership.

Alteration of Rule.

Rule 22 of the Association has hitherto read—"Each member of the Association shall be furnished annually by the Secretary with a copy of the regulations, and with a list of the names and residences of the members."

Mr. D. H. Helps (Reading) moved that the words "with a copy of the regulations and" be deleted. He explained that the Committee thought it unnecessary to go to the expense of sending out a copy of the regulations every year.

The President seconded the motion, which was unanimously carried.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I thank you for the honour you have done me in electing me as your President for this year. While I appreciate that honour highly, I have frequently wondered lately whether I should not have been a much happier person had you selected some other and more worthy representative to fill the office which I am proud to occupy to-day. I cannot help feeling that you have taken some risk in electing as your President a man of limited experience, who is, by reason of the situation of his work, somewhat out of touch with the body of the industry; and I should look to the coming year with anxiety were it not for the fact that I know I can rely on the support of our able Honorary Secretary and of the Committee, and the hearty co-operation of the members, to enable me to maintain undiminished the prestige and dignity of our Association.

The Favoured Supplier of Electricity.

As a recruit from the body of electrical engineers, I have watched with much interest the growth and practice of our rival industry; and, while admiring much that they have done, I have at the same time found myself sometimes at issue with their methods, and at other times envying their freedom from legislative restrictions. In those days in the history of gas lighting when people thought the final stage of illumination had been reached, it was reasonable that Parliament, in granting exclusive rights of supply, should place such restrictions on companies entrusted with the distribution of gas as to prevent them exercising the privileges of a monopoly to the prejudice of the public. When electricity was brought into commercial use, the gas industry was firmly established; and Parliament apparently recognized that electricity was only an alternative illuminant, and left electric lighting companies comparatively untrammelled. They did not, however, relax the severe and complex regulations that governed gas companies; and it is only after years of arduous toil on the part of a few of the larger gas companies, and, of certain courageous and able gentlemen representing them, that these restrictions have in some degree been relaxed. Meanwhile, our electrical friends have availed themselves to the full of the wider powers granted them to cut into the business of the older industry. Free wiring, fanciful methods of charge, rebates and discounts on a scale never dreamt of by gas companies, have all been used in their turn in the effort to obtain consumers of electricity; and, however much we may disapprove of the methods adopted, it behoves gas engineers and managers to keep in touch with those methods, in order that we may be forearmed and prepared to meet them.

Certain electric light companies are introducing into their free-wiring agreements a clause which prohibits the consumer, in consideration of certain special terms, from using any other methods of lighting during his tenancy of the property. Where the installation is being placed in new property, this may be a reasonable precaution on the part of the electric light company. Where, however, the installation is to be fixed in property the tenant of which is already using a prepayment installation which a gas company has been at the expense of fixing, it is not fair trading for an electric light company to canvass that gas consumer with a view to obtaining his signature to an agreement which would, to all intents and purposes, remove from use during his tenancy the capital already invested by the gas company.

Restrictions to trade are undesirable; and it has been held by persons eminent in the law that there is nothing to prevent two or three gas companies joining together to test at law the power of the electric light companies to insert such a clause; and I trust that this will be done at an early date. Failing such action, it behoves all gas companies to look into their agreements, and see whether something cannot be introduced to protect them from such attacks as these—at any rate where prepayment installations are being put into new premises.

Our electrical friends are not restricted by testing clauses, and, subject only to the very proper reservation that "they shall not show any undue preference to any local authority, company, or person," they are free to charge in such manner and to allow such rebates or discounts as they may think fit.

Relaxation and the Revision of the Gas-Works Clauses Act.

Mainly owing to the efforts of Sir George Livesey, the London Gas Companies have secured immunity from the old sulphur clauses, and have been granted the use of a fair and reliable standard burner, with which latter the gas industry will always gratefully associate the name of Mr. Charles Carpenter.

It is everywhere recognized that the Gas-Works Clauses Acts are out of date and require revision; and it is desirable that the gas industry as a whole should be freed from many of the fetters imposed upon it by these Acts, and that all gas companies should be able to avail themselves of the advance of modern science and legislation. An individual gas company approaching Parliament to obtain relief from testing clauses, however oppressive and unjust, incurs heavy cost, and lays itself open to attack, and possible injury, over the whole field of its affairs. What is wanted now is permanent relief for the whole gas industry, in the shape of a new or amended Gas-Works Clauses Act. We have been told, and I think rightly, that in future the Institution of Gas Engineers should interest itself in all important movements affecting the welfare of the gas industry. Here, then, is a work which, carried to a successful conclusion, would amply justify the recent amalgamation of the two societies, and the high hopes with which we looked to the future of the united Institution. If the Council were to apply to all gas companies and municipalities owning gas-works for the funds that would be required if they took this matter in hand, I am certain that the necessary money would be subscribed; and they could look also for the hearty and unanimous assistance of the whole industry and this Association. The work is, however, urgent. Public opinion at the present moment seems to be in favour of granting greater freedom in gas manufacture; and the next session of Parliament should certainly see the new Bill introduced.

Supposition and Investigation.

While on this subject, I should like to allude to another direction in which I think the Institution could, and should, take action. At the present moment, there appears to be very little doubt in the minds of the public as to the economy of gas for lighting purposes *per se;* but our electrical rivals have put abroad very assiduously and thoroughly ideas as to the injurious effect of the products of combustion on personal health, fabrics, leather, and decorations generally; and, in consequence, many people are inclined to think that, putting one thing with another, there is not after all much difference in cost between the two illuminants. Nothing but the opinion of the very highest and best known scientists can permanently remove the impression fostered by these reports; and such opinion, backed up by the necessary tests, can only be obtained at heavy cost. It is only by united action that gas companies can afford to engage the very best experts; and here, again, is a field for the Institution.

I think that at one time many persons hoped that this kind of work might possibly be undertaken by the Gas Companies' Protection Association. Unfortunately, the funds available have not been sufficient to enable that Association to work on a very large scale; and while much has been accomplished that has been of value to the industry, the Institution is better fitted, by reason at once of the information and knowledge at its command and the facility with which it can raise funds, to undertake such work as I have referred to. I speak with the greatest deference as to the Association and the Presidents and Committees who have so

generously given their time and services to its work; but it seems to me that, in view of the excellent organization we now possess in the Institution of Gas Engineers, an arrangement might be made for that body to take over the funds and work of the Assotion. A larger amount of these funds would, I think, be available by this concentration, which added to the funds of the Institution would enable legislative and other work to be undertaken on a larger scale than can be contemplated by two separate organizations.

IN THE CAUSE OF LABOUR—EDUCATIONAL EFFORTS.

Much has been said at our meetings with regard to the training of the rising generation of gas engineers and managers, but little with regard to the education of our rank and file. Socialism, Trade Unionism, and modern legislation have, all in their way, tended to destroy those bonds of friendship and personal interest that used to exist between employer and employed. Probably they are all necessary, and have done good in their way; but, so far as my experience goes, the result up to the present has been destructive rather than constructive—a levelling-down and not a levelling-up.

We are constantly hearing of the heart-breaking carelessness, thoughtlessness, and slackness of the average man—of slipshod assistance, foolish inattention, and half-hearted work. These complaints are often justifiable; and the position is likely to become worse if employers of labour are content to swim with the tide rather than bestir themselves to meet the altered conditions of labour. I believe that eventually salvation will be found in profit-sharing. But if profit-sharing is to be permanently established, the benefits must be mutual, and result both in the prevention of strikes, and also a financial advantage to both employer and employed. The mass of employees must realize that the price of profit-sharing is individual responsibility, and must show, by intelligent, loyal, concentrated work, that the time has arrived for granting it.

In the meantime, the efforts of those who control enterprises where large numbers of men are employed should be united in the endeavour to make each individual man take an intelligent interest in his work—to think about and understand it. If only this condition can be arrived at, all the inability or unwillingness to concentrate upon a task will vanish, and we shall find the man enjoying his work, and developing at last into a genuine craftsman instead of the inert, apathetic individual with whom most employers are more or less well acquainted. Initiative must supply the place in the employee of responsibility in the manager; and, after all, the two conditions are very closely allied.

Dealing particularly with the case of employees of a gas company, I think that much good can be done by evening lectures, followed by discussions on subjects directly or indirectly connected with the work of the company. The discussion should be the most valuable part of the evening, though I am bound to admit that, so far as my own experience goes, it is most difficult to get men to express their views. Classes in "Gas Manufacture" and "Chemistry," held on the works, are very valuable; and now that there are evening extension classes held in the secondary schools of practically every town, the interest of the students in their work can be maintained from year to year, especially if the company will pay the fees of such students, and receive reports from the education authorities on their attendance and work.*

On the works, it is difficult to offer bonuses to the employees apart from profit-sharing; but, as an encouragement to intelligent co-operation, the "Suggestions-Box" which my Directors adopted, on my recommendation, rather more than two years ago has worked remarkably well. On each of the Company's works, an ordinary letter-box is fixed, in which employees can place any suggestions they may have to make on matters affecting the Company's interests. These suggestions are collected and tabulated every month; and at the end of the quarter a certain fixed sum is divided among those who have contributed suggestions. The whole of this sum is distributed irrespective of the quantity or quality of the suggestions received; and in apportioning the amounts, we endeavour to give at any rate a recognition of every suggestion, however small or unimportant it may be. At the end of the year, one single prize of £5 is granted for the best suggestion of the year.

The sources from which some of the suggestions come are most surprising; and I can unhesitatingly say that the increased interest which the men take in their work has been marked, and the Company have distinctly benefited by the scheme. I am pleased to say that at their last meeting my Directors felt that the sum allotted was not sufficient to provide a sufficient recognition of the suggestions received for the quarter ending Christmas last; and they allotted a further sum. The "Suggestions-Box" not only stimulates employees to show an increased interest in their work, but, as all the suggestions have to be described and frequently illustrated, the education of the competitors is further assisted in these most useful directions.

Wherever possible, I believe in paying for work at piecework rates, with a fixed minimum day's work and wage, and a sharing between employee and employed of the profit earned beyond the minimum; and I think that all profit-sharing schemes should be based on these lines—division being made in accordance with the net profit of the company in any year.

CONSIDERATION FOR THE FOREMAN.

While the difficulty of obtaining good workmen is marked, the question of foremen is also a serious one. No doubt the independence of the men and the somewhat aggressive attitude fostered by Trade Unionism and combination have contributed to make men unwilling to stand out from the crowd and accept the responsibility of controlling their fellow-workmen. In addition to this, however, the benefits offered to a foreman are often insufficient either to render the position very attractive in the first place, or to ensure his making every effort to maintain discipline and efficiency after he is appointed. The ideal foreman would make his mark in almost every branch of life; and when we consider the list of qualifications which he requires, it is perhaps no wonder that we rarely find him.

I think it is highly desirable that foremen should, where possible, be paid a bonus on the results obtained. Conditions vary in different works; but at Poole, where the works are in charge of one foreman on each shift, we have reduced the foremen's wages, and pay a bonus calculated on the following figures:—

Retort-House.

$$\frac{\text{Make per mouthpiece} \times \text{make per ton}}{1{,}000{,}000}$$

Carburetted Water-Gas Plant.

$$\frac{\text{Candles per gallon} \times 1000}{\text{Pounds of coke per 1000} \times \text{percentage of } CO_2}$$

Sulphate Plant.

Pounds of sulphate per ton of coal.

The bonus is shared by the whole of the shift foremen, so that all are penalized by the carelessness or negligence of one.

I do not think candle power should be included in any bonus scheme. Such definite illuminating power must be maintained on the works as to ensure that gas of the full illuminating power prescribed by Parliament is delivered at the testing-stations; and it would be unwise to permit the possibility of variations of illuminating power to be thought of. The work of a foreman is often very harassing. We all know that troubles never come singly; and when men are troublesome, heats are back, pipes stopped, condensers and washers choked with naphthalene, and the tar-main bursts, a foreman's lot is not a happy one. It seems to me that, if anyone is entitled to reduced hours of labour, it is the foreman; and, under any circumstances, arrangements should be made to ensure his having at any rate one day a week to himself, without having to work extra time to obtain it. If such points as these are studied, I think the position of foreman will be a sufficiently attractive one to excite keen competition among the men best qualified to fill it, and to provide an incentive to study and self-improvement.

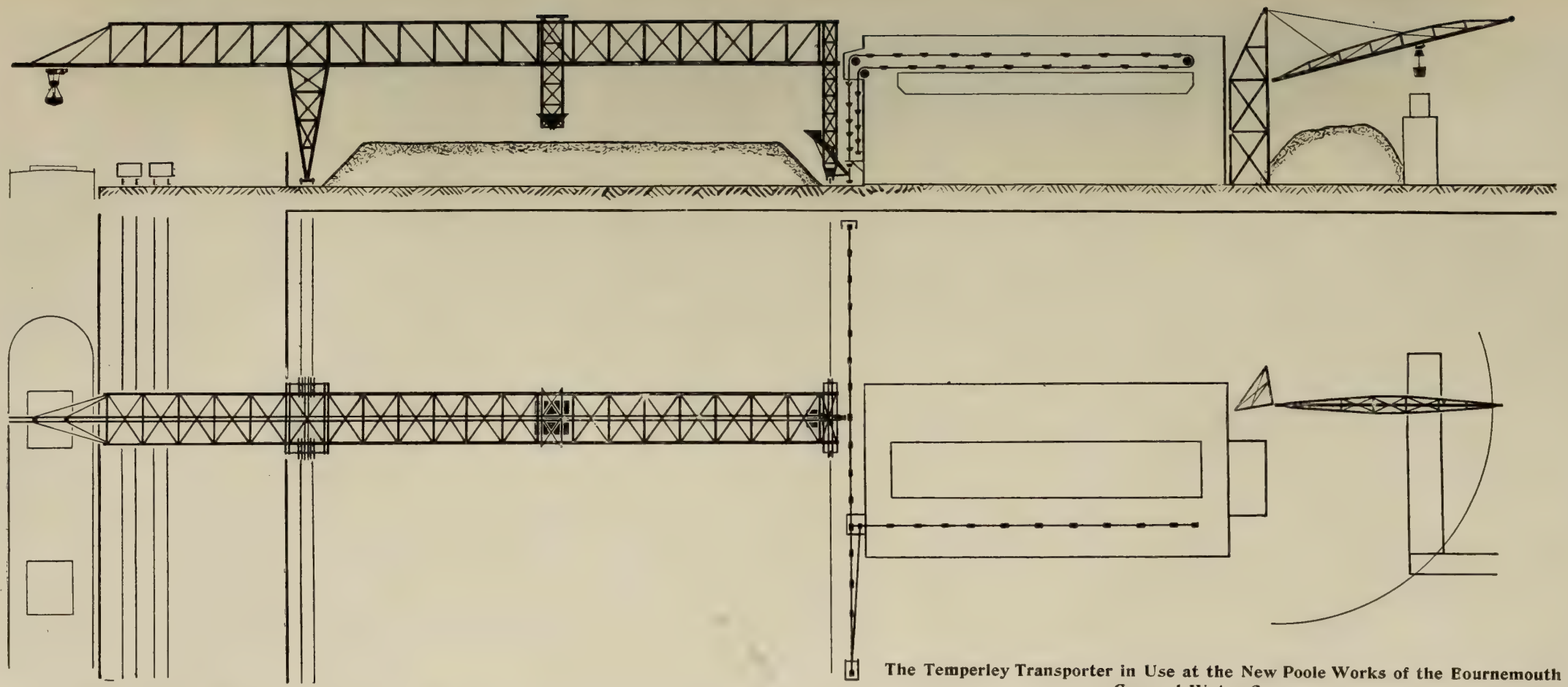
RECREATION OF THE MEN.

Now that shorter hours of work are the rule, the question of recreation is assuming an importance that it did not previously possess. It may not be a good thing for a man's thoughts to be directed too much to play; but it is a great deal better that he should indulge in some healthy and manly sport than that he should loaf about with nothing definite to do. Practically every form of amusement involves expense and organization; and a very slight amount of trouble on the part of the staff, and a comparatively small outlay by the company, can do much to provide healthy recreation, and ensure its being carried out in a wholesome manner. The Directors of the Bournemouth Company have always taken a great interest in the recreations of their employees, and have contributed to an athletic ground and provided a gymnasium and miniature shooting-range; and I am satisfied, from careful observation, that both the employees and indirectly the Company benefit by the healthy spirit introduced.

ROAD TRACTION AND COSTS.

Owing to the somewhat extensive district covered by my Company's operations, and the distance of their pumping-stations from the gas-works (we supply an area of 34 square miles with water and 52 square miles with gas), the question of haulage is an important one; and my Directors have from time to time authorized the purchase of various motors for this purpose. The ordinary steam motor waggon, using coke for fuel, and carrying about 4 tons, we find very useful for inter-works communication, and for the supply of some of our large consumers; but experience shows that, if we are to retain our popularity, it is not wise to permit such a motor to leave the public highway unless one is well acquainted with the surface and underground conditions of the route it is proposed to traverse. In greasy weather, also, care has to be taken with regard to the route traversed. The chief objection to the steam-waggon is its weight. Everything has to be cut down as far as possible so as to minimize this; and the wear and tear is considerable. Petrol-lorries, carrying about

* The President remarked, at this point of his address, that they started evening lectures and discussions at Bournemouth two years ago. They had the lecture first, then coffee and cakes, and discussions afterwards. The lectures were held every fortnight; and there was an average attendance of 90 men. They started a class in gas manufacture; and they sent from the works nineteen men for examination, eighteen of whom passed—three he believed with honours. Then in Bournemouth a chemistry class was started, and a course got up in workshop arithmetic, electricity, and drawing. The Company offered to pay the fees of the men attending these classes. Some 27 of the men accepted the offer, and had made an average attendance of 90 per cent. So they had every reason to anticipate that encouragement offered to the men would receive support from them.



The Temperley Transporter in Use at the New Poole Works of the Bournemouth Gas and Water Company.

30 cwt., are the most convenient for general work; but, owing to the nature of the roads over which ours travel, we have had considerable trouble with tyres. We have recently obtained spare wheels, so that the lorries may not be laid up while the wheels are re-tyred; and I have no doubt that the earning power of the lorries will be considerably increased by this means.

Where material such as coke or coal is required to be carried in bulk, the small steam-tractor, burning coke, is a handy and economical motor; and while our experience with this has only extended over a short period, the results obtained are very satisfactory. The tractor has no load to carry; and consequently the boiler and all the moving parts are much bigger than in the case of the steam-waggon.

	Cost.	Weight Unladen. Tons.	cwt.	qrs.	Load. Tons.	cwt.	Width of Back Tyres.
Steam-waggon	£585	4	4	4	4	0	9 inches
Petrol-lorry	595	2	19	3	1	10	7 ,,
,, ,,	595	2	19	3	1	10	7 ,,
Steam-tractor, two trailers.	593	6	10	0	6	0	12 ,,

The cost per ton-mile of working motor vehicles for the year 1906, including labour, stores used, replacements, and interest on capital, but not including depreciation, was—

	Cost per Ton-Mile.
Steam-waggon	11·09d.
No. 1 petrol-van	8·76
No. 2 ,, ,,	9·60

Against an average cost of 1s. 4d. per ton-mile for horse hire. The steam-tractor we have had running only some three months; but during that time it has hauled coke in bulk from our Poole works at an average cost of less than 4d. per ton-mile. This is a new tractor; and so there has been no cost of repairs.

There is one thing that should be borne in mind in connection with this question of motor traffic, and that is that, while it is desirable to write off the capital value of commercial motors in (say) seven or eight years, their value is not, as is the case of ordinary motor cars, in any way dependent on fashion; so that, if they are properly maintained, their useful life should be quite a long one.

THE NEW GAS-WORKS AT POOLE—TEMPERLEY TRANSPORTER AND ELECTRIC DRIVING.

I understand that some little interest has been expressed in the new gas-works at Poole and the electric driving adopted there; so perhaps a few remarks thereon may be of interest. My Company's land on Poole Quay is limited in extent; and in laying out the works it was necessary to utilize the whole of the ground to the best advantage from the point of view of economy of space. The quay is a public one, and the placing of cranes upon it is open to objection on more than one score. The Hunt gravity truck and similar arrangements for loading into store were unsatisfactory, as they did not utilize the ground space to the best advantage, and additional apparatus had to be arranged for taking coal from the store into the retort-house. After much consideration, I submitted a scheme to the Temperley Transporter Company and two other similar companies; and my Directors eventually accepted the tender of the Temperley Company. The transporter is 180 feet span between the rails of the travelling supports,

and has an overhang of 75 feet. It can be worked with the overhanging end lifted if desired. The main framework is 45 feet above the ground level, which leaves room to operate the grab over a storage of coal some 30 feet deep. The transporter can be traversed the whole width of the coal-store, and it spans the entire length; and there will be room for six weeks' stock of coal in front of each retort-house, with coal stored 16 feet deep. Coal can be taken from ship either in grabs or in skips. A weighing-machine is suspended from the main beam and can be traversed the whole length of the conveyor by means of an electric motor. A hopper is provided above the weighing-machine, so that the grab can travel direct from the ship's hold, drop the charge of coal into the machine hopper, and return at once for a fresh charge. Meanwhile, the machine comes to rest, the charge is weighed, dropped on to the stock heap, and the machine prepared to receive the fresh charge by the time the grab is back again. By this means there is no delay of the grab while the weighing machine comes to rest, and the speed of operation is much increased.

Where a fixed weighbridge on the main beam is used, considerable delay must take place. The grab then picks up its charge, attains its maximum acceleration, slows down, and comes to rest momentarily on the weighbridge, and then has to accelerate to its full speed again, and finally slow down and stop to discharge. Through the adoption of the travelling weighbridge, we are able to unload coal rapidly with one grab only. The best we have done from ship into store is 52 tons per hour; the best for a whole cargo is 800 tons in 22 hours, or 37 tons per hour. It must, however, be remembered that this is the first transporter built exactly on these lines; and the Temperley Company have at present several slight alterations in hand that will materially increase the speed of working.

ELECTRICITY GENERATED BY GAS-ENGINES.

A 70 H.P. electric motor is required for hoisting the grab, with a 37 H.P. motor for traversing it. A 26 H.P. motor is used to move the transporter across the coal-store; and a 2½ H.P. motor traverses the weighing-machine on the beam. The only power that would enable a speed of 50 tons per hour to be reached was electricity. We are using De Brouwer machinery in the retort-house, for which electric motors are required; so that, as practically three-fourths of the power required on the works would almost necessarily be operated by electricity, it seemed worth while to take this as our general power throughout the works, generating it by means of gas-engine dynamo plants. Up to the present we have not experienced any trouble from the electric installation at Poole; and it is working in an economical and satisfactory manner. The most convenient method of employing power must necessarily depend upon local conditions. At Poole it seemed advisable to utilize electricity generated primarily by gas-engines; and up to the present we have seen no reason to regret the decision. During the half year ending the 31st of December last, we generated 160,824 units of electricity at a cost per unit of 0·467d. for labour and 0·509d. for gas, or a total of 0·976d.

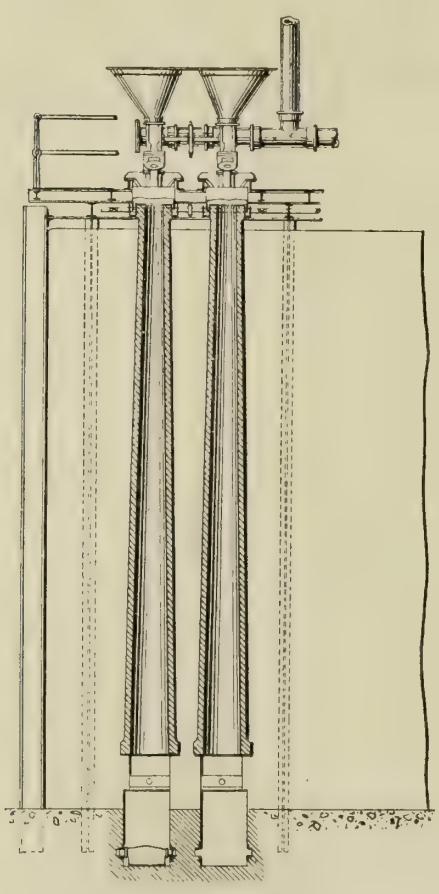
STEAM PRODUCTION.

The steam required by the water-gas plant and the sulphate plant is generated by two Stirling boilers, fired with breeze by means of underfeed stokers. The breeze is weighed into the boiler-house and the water metered. The cost of working is taken out every week; and we find that when the boilers are working at three-quarter load the evaporation is 6 62 lbs. of water per pound of fuel from and at a temperature of 212° Fahr. This is only an ordinary working figure, and not a special test one; and it seems to point to an economical combination of units.

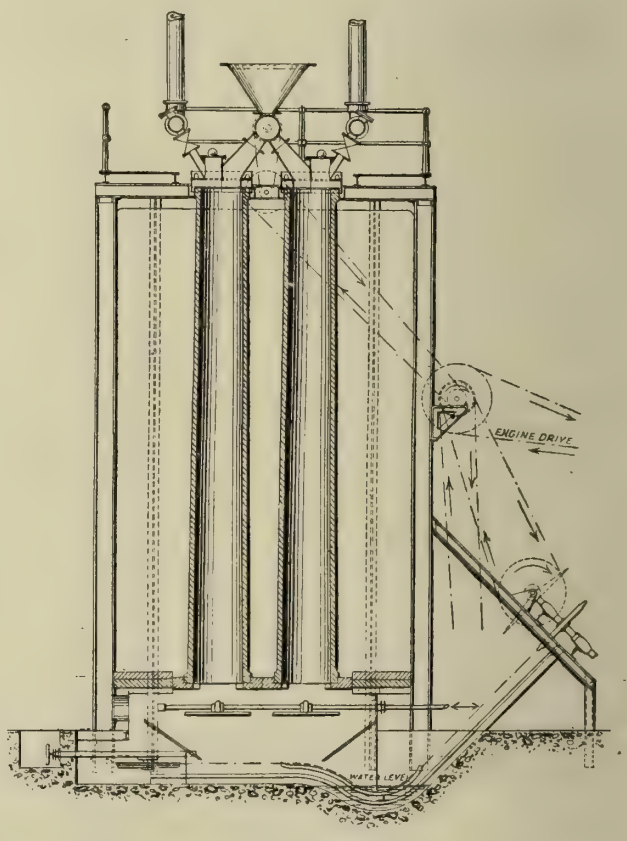
CONTINUOUS CARBONIZING IN VERTICAL RETORTS AT BOURNEMOUTH.

I should not like to conclude my address without a few words on the subject of continuous carbonization in vertical retorts. The present plant at Bournemouth has only been in operation for a short time; but I feel that the description of a mechanical process by means of which continuous carbonization has been attained is likely to be of interest to the Association, though the arrangements in connection with the measuring of coal, gas, and residuals are not yet sufficiently in order to enable me to deal to-day with working results.

I have here a small model of the plant with which we started in 1903; and the principle of the process will be readily understood



Longitudinal Section.



Cross Section.

Woodall-Duckham Vertical Retorts.

from it. The system primarily consists of a substantially vertical retort, tapered from the top to the bottom, with a conveyor for removing the coke from the bottom, and a feeding device which allows the required quantity of coal to enter at the top. The whole is so formed and actuated that the amount of coal carbonized is regulated by the rate at which the conveyor removes the coke from the bottom of the retort; the charge of coal and coke in the retort forming the intermediary between the conveyor and the feeding device, and allowing only an amount of coal to enter the retort proportionate to the coke removed by the conveyor. A shoot connects the feeding device with the retort; and the coal follows down this shoot on to the charge in the retort as the coke descends. Thus there is usually a space at the top of the shoot just before the feeding device is in a position to deliver coal into it. The feeding device is so actuated that even after filling up the space in the shoot, there is always coal left in it; but the special formation of the feeding device that is employed prevents this excess of coal from putting an injurious pressure on the charge or the retort. By the combination of the coke-removing conveyor, the charge of coal and coke in the retort, and the special form and working of the feeding device, constant and continuous conditions of carbonization are ensured. The retorts are rendered gas-tight while carbonizing, by providing the feeding device with gas-tight working faces, and by extracting the coke

through a water-seal. The coke as it descends from the retort into the water-seal is quenched, and the steam formed ascends the retort, and is converted into water gas; thus making use of the heat in the coke.

This single retort was worked with satisfactory results for a considerable period, and was followed by a setting of four vertical retorts worked on exactly the same principle. The results obtained from this setting were such that my Directors decided to erect a considerable installation at the Bourne Valley station.

I have here a diagram of the process as at work at Bournemouth at present, and as it will be shortly both in London and Liverpool. The settings are each composed of four vertical retorts differing chiefly from the old settings in that, instead of removing the coke directly from the retorts by a conveyor, a reciprocating discharging device has been introduced which regulates the rate of carbonization, and discharges the coke on to a quick-running conveyor, which passes through a water-seal and discharges the coke outside the setting. The retorts are heated most highly at the top; the combustion chamber being at the top of the setting. The flue gases are drawn down to the bottom, whence they pass into the regenerators. Demonstration is often more valuable than description, and as the Association have accepted the invitation of my Directors to visit their works in the summer, I can look forward with pleasure to showing you the vertical retorts in operation at an early date.

In conclusion, I may say it is pleasant to find each year bringing renewed prosperity to the gas industry, despite competition in every form; and while the immediate future is not without its anxieties, we can face them cheerfully, knowing that we have ample resources to weather any passing storm.

At the close of the address, questions were asked regarding the vertical retorts by Mr. S. Y. Shoubridge, Mr. J. Tysoe, Mr. D. H. Helps, and Mr. A. F. Browne.

The PRESIDENT, in reply, stated that they worked the charge through the retort in about ten hours. They had not, however, yet been working long enough to know the best time to occupy in working a charge through. One point he might mention in connection with this was that to bake coke for ten hours was not a desirable thing—even with horizontal retorts. With their vertical retorts, they had a certain amount of steam passing in at the bottom, and they found the coke there was almost black, showing that the action of the steam cooled the coke, and prevented any injurious baking action there. The bottom of the retort was kept tight by the plate forming the water seal. The coke was pushed away by an ordinary push-plate conveyor. The diagram showed the two guide-rails which formed the roller path. Up to the present, they had not got the figures sufficiently together to give detailed results of working. Regarding carbonic acid in the gas, they had never exceeded 2·5 per cent., but had not yet analyzed the gas to ascertain the quantity of carbon monoxide in it. Any illuminating power that was wanted could be obtained; it was merely a question of regulating the speed at which the charge was run in. The pressure at the bottom of the retort was practically identical with what they were working at at the top. They had endeavoured to keep a perfectly level gauge. He had seen a pressure of ½ inch without the faintest sign of leakage anywhere. As to the size of the coke, sometimes it was big; and sometimes small. It worked out to about the average of the coke in ordinary working, but, if anything, was rather larger. It was a very hard coke. The steam was produced as the hot charge met the water; but they were not at all anxious to generate any considerable amount of steam.

Mr. NORTON H. HUMPHRYS (Salisbury) then proposed a vote of thanks to the President for his interesting and instructive address. Mr. Woodall had introduced himself to them as a recruit from the electrical industry; and he was sure the gas industry might congratulate itself upon the strength of the recruit. The electrical industry had lost a powerful individuality; and the gas industry had had the privilege of gaining one. Mr. Woodall was a gentleman who was able to appreciate the numerous problems with which gas managers had to deal at the present time. They were never more numerous; and they seemed to increase every year. And the President not only appreciated them, but he found practical ways of dealing with them. The members were looking forward with pleasure, he was sure, to the privilege of seeing the arrangement of vertical retorts and coal transport at Bournemouth.

Mr. JAMES W. HELPS (Croydon) said that he had known Mr. Woodall practically all his life. He knew him when he was studying to gain experience in his mechanical work; and he knew him when working as an electrical engineer. He (as Mr. Humphrys had done) congratulated himself and the industry when he heard that Mr. Woodall was going to forsake the perhaps more fashionable pursuit of electricity for the more commonplace but, he thought, more reliable industry with which those present were all connected. He knew when Mr. Woodall came into the gas profession that he would introduce many novelties and original ideas in connection with gas-works practice, and he left the members to decide whether or not that view was a correct one. He thought that anyone who had listened to Mr. Woodall that day would acknowledge that he was a man of many ideas, and one who had the pluck and courage to carry them into practical effect, and to prove to his Directors that, in allowing him to do so, they had done something that must redound to the prosperity of the undertaking of which they had charge and of the industry generally. The members looked forward to going to Bournemouth to see the practical proof of what they had heard about that day; and they were all anticipating an extremely profitable year under Mr. Woodall's presidency.

The motion was carried with applause.

The PRESIDENT acknowledged the kind words of the mover and seconder. He felt sure that nothing but kindness and genuine feeling prompted the remarks and their endorsement by the members. However little he deserved the kind words and thanks, he appreciated them very sincerely.

DISTRICT COUNCILLOR.

The HON. SECRETARY announced that the Committee had nominated the President as district representative on the Council of the Institution of Gas Engineers for 1907-8.

This concluded the business proceedings.

THE ANNUAL DINNER.

There was time for a little social intercourse before dinner; but the centre of interest in the interval was a model of the vertical retort, with means for operating by hand the charging device and the discharging conveyor. The President and Mr. Duckham were bombarded with questions as to details, which they answered freely so long as they did not pass the demarcation between construction and result. While one constructional detail was found to be faulty, one detail in method deficient, Mr. Woodall has consistently maintained that—the operations from charging to discharging being so interlinked—results must thereby be vitiated; and till every operation obtains its proper relationship to the others, reliable figures are out of the question.

At the dinner, among others attending, were the President of the Institution of Gas Engineers (Mr. Charles Hunt), Mr. Corbet Woodall, Mr. H. E. Jones, and Mr. Hubert Pooley, of Stafford, the President of the Midland Association. The toasts were of the usual order; the speeches exceptionally good. An excellent programme of music and song also gave much pleasure. In the course of the speeches, there were references to the special work in which the Institution of Gas Engineers are aspiring to engage. A few of the remarks are worth putting on record. Mr. Corbet Woodall said if the work undertaken by the Institution was likely to be productive of good, there would be no lack of funds to carry it on. The London Gas Companies were quite capable of carrying on investigations themselves; and they were doing so at their own cost. But he was sure there was patriotism among, and *camaraderie* enough between, the gas companies and corporations of this country to cause them to join heartily in any such work for the benefit of the whole industry. Later, the President of the Institution (Mr. Hunt) remarked that he was glad to have from Mr. Corbet Woodall the assurance that help would be forthcoming whenever the need for it arose—whenever it was shown that the Institution were undertaking a really useful work in the matter of investigation. One subject had been taken in hand. They had undertaken to investigate the question of carbonization. He thought it would be agreed that there was no more important subject before the gas industry at the present time, or one that the Institution could more usefully investigate. The President of the Association had done much towards elucidating this important problem; but the Council of the Institution wished to bring to a focus all that had been done, and all that was being done, to raise the level of carbonization. He hoped the Institution would receive, during the next few weeks, an important contribution from the great Company of which Mr. Corbet Woodall was the respected Governor.

PROFESSOR GRAY ON FLAME TEMPERATURES.

In the "JOURNAL" for the 5th inst. (p. 686), we noticed briefly a lecture on "Flame Temperatures," delivered by Dr. THOMAS GRAY, of the Glasgow and West of Scotland Technical College, before the members of the Western District Section of the Scottish Junior Gas Association, on the preceding Saturday. It was mentioned that Dr. Gray was preparing for publication a summary of his lecture; and this has now come to hand.

Professor Gray said the subjects of "Flame Temperatures" and "The Atmospheric Burner" had been so ably dealt with by Professors Smithells and Lewes in their lectures to the Institution of Gas Engineers, that it would be difficult to present any new information. But after having considered these lectures—with which he supposed the members were familiar—he thought it might be interesting if he were to explain the method of calculating the maximum temperatures attainable by the combustion of various gases in air. He referred to the lecture on "Flame Temperature and its Practical Aspects" (*ante*, p. 217), in which the authors of text-books generally were subjected to severe criticism for their failure to give the reader useful information on practical subjects; the lecturer directing his remarks more particularly to a well-known text-book on Physics, in which he had searched in vain for instruction on the method of calculating the flame temperatures of gases from chemical and thermo-chemical data. Dr. Gray next called the attention of his audience to a book entitled "Industrial Furnaces," by Damour, translated by

Queneau, in which such calculations are very fully explained, and said that he would draw freely from this source for the purposes of his lecture. He then demonstrated the Junkers gas-calorimeter, and referred shortly to the method of determining calorific values. He reminded members that the water which is formed by the combustion of hydrogen and hydrocarbons leaves the flame in the form of vapour; whereas in the calorimeter it is condensed to liquid, giving up its latent heat in the process. A deduction must, therefore, be made from the values determined experimentally, to give the net calorific values, which represent the number of heat units generated by the combustion of unit volumes of the gases, when the water is retained in the form of vapour. Assuming all the heat of combustion to be utilized in raising the temperature of the products of combustion—none being lost by radiation or otherwise—it was easy to calculate the temperature which would result if the volume and specific heat, or thermal capacity, of the products were known. In the earlier calculations, the specific heats of the various gases at high temperatures were assumed to have the values which had been determined experimentally between 0° C. and 100° C., with the consequence that the calculated flame temperatures greatly exceeded those attainable in practice. But later investigation had proved that the specific heats of gases increase with rise of temperature; and this observation explained, to some extent, the differences between calculated and observed temperatures.

The lecturer here directed attention to some tables of figures which had been distributed, and which are reproduced below.

TABLE I.—*Molecular Calorific Values.*

Substance.	Molecular Formula.	Molecular Weight.	Net Calorific Value per Gramme Molecule.
Hydrogen . . .	H_2	2	58·2 calories
Methane . . .	CH_4	16	195·2 ,,
Ethylene . . .	C_2H_4	28	319·6 ,,
Benzene . . .	C_6H_6	78	753·6 ,,
Carbon monoxide	CO	28	68·2 ,,

TABLE II.—*Volumes of Oxygen necessary for Complete Combustion of One Volume of Gas and Volumes of Products of Combustion.*

Gas.	Volumes of Oxygen for 1 Volume of Gas.	Volumes of Products of Combustion from 1 Volume of Gas.	
		CO_2	H_2O
Hydrogen	0·5	..	1
Methane	2·0	1	2
Ethylene	3·0	2	2
Benzene	7·5	6	3
Carbon monoxide. .	0·5	1	..

Note.—Air contains by volume: Oxygen, 21 per cent.; nitrogen, 79 per cent. One volume of oxygen is therefore accompanied by $\frac{79}{21}$ volumes, equal to nearly 4 volumes of nitrogen. The volume of air necessary for combustion is: Volume of oxygen $\times \frac{100}{21}$, or approximately five times the volume of oxygen.

TABLE III.

[From "Industrial Furnaces," by Damour.]

Thermal Capacities per Gramme Molecular Volume in Calories.

Temp.	O_2, N_2, H_2, CO.	H_2O.	CO_2.	CH_4.
1000° C.	7·43	10·98	12·22	15·77
1200°	9·05	13·87	15·55	20·37
1400°	10·73	17·00	19·18	25·44
1600°	12·46	20·35	23·10	30·99
1800°	14·21	23·86	27·21	36·86
2000°	16·05	27·76	31·84	43·55
2200°	17·91	31·82	36·65	50·54
2400°	19·84	36·10	41·76	58·02
2600°	21·81	40·62	47·16	66·04
2800°	23·82	45·64	52·84	74·42
3000°	25·89	50·64	58·86	83·34

The lecturer went on to say that the calorific value of a gas was usually expressed in British thermal units per cubic foot, or in calories per cubic metre, but that a statement in the form of "molecular heat of combustion" was for some purposes more convenient. It was then possible to attach the number of heat units liberated during combustion to the chemical equation which represents the reaction, and to read directly from the equation the weights and the volumes of the gases. Thus the equation $H_2 + O = H_2O + (58{\cdot}2$ calories) conveys the information that 2 grammes of hydrogen developed sufficient heat in combustion to raise the temperature of 58·2 kilogrammes of water 1° C. He further explained that the molecular weight, expressed in grammes (see third column of Table I.), of each of the gases occupied the same volume—viz., 22·32 litres, at 0°C. and 760 mm.; and that this quantity would be referred to as the "gramme molecular volume," or, more simply, "molecular volume." The equation therefore also shows that the molecular volume of hydrogen (22·32 litres) generated 58·2 calories during combustion.

As the quantities of the various gases represented by the formulæ H_2, CH_4, C_2H_4, C_6H_6, CO, O_2, N_2, and H_2O (vapour), all occupied the same volume, the amount of oxygen necessary for combustion and the volumes of the products given in Table II. could be read directly from the equations—

$$H_2+O=H_2O \quad CH_4+2O_2=CO_2+2H_2O \quad C_2H_4+3O_2=2CO_2+2H_2O$$
$$C_6H_6+15O=6CO_2+3H_2O \quad CO+O=CO_2$$

Note: $O = \frac{1}{2} O_2 = \frac{1}{2}$ molecular volume.

In explanation of Table III., which was calculated from the results of the experiments of Mallard and Le Chatelier, the lecturer stated that the figures showed the number of calories necessary to raise the temperature of the molecular volume of each of the gases from 0°C. to the temperatures given in the first column.

The method of calculating the maximum temperature which can be produced by burning a gas with air, both being used cold, was illustrated with the help of the following examples:—

Hydrogen Burning with the Theoretical Quantity of Air.

Equation: $H_2 + O = H_2O$ (+ 58·2 cal.).

1 mol. vol. of hydrogen unites with $\frac{1}{2}$ mol. vol. of oxygen, producing 1 mol. vol. of water vapour.

$\frac{1}{2}$ mol. vol. of oxygen is accompanied in air by 2 mol. vols. of nitrogen.

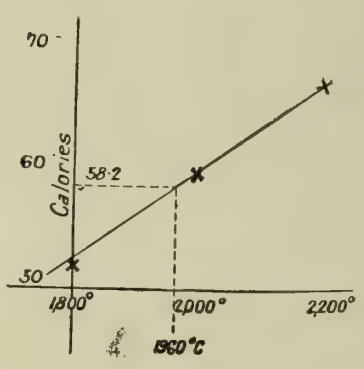
The products of combustion of 1 mol. vol. of hydrogen are therefore: 1 mol. vol. of water vapour, and 2 mol. vols. of nitrogen. These quantities are heated to the temperature T by the heat of combustion—viz., 58·2 calories = T is found with the help of Table III., thus:

To heat—

1 mol. vol. of water vapour from 0° to 1800° C. .	23·86	calories required.
2 ,, ,, nitrogen ,, ,, ,, ,, .	28·42	,, ,,
Products of combustion of one mol. vol. H_2 .	52·28	calories required.

The corresponding values for 2000° C. and 2200° C. are found in the same way. These are stated below.

Products of Combustion from 1 Mol. Vol. of Hydrogen.	Thermal Capacities.		
	1800° C.	2000° C.	2200° C.
1 molecular volume water vapour .	23·86	27·76	31·82
2 ,, volumes nitrogen . .	28·42	32·10	35·82
Total	52·28	59·86	67·64



The lecturer said it was evident, from an inspection of these figures, that the heat of combustion, 58·2 calories, was sufficient to raise the products of combustion to a temperature not far short of 2000° C. The exact value of T was found from the accompanying diagram, representing as it does the relation between the temperatures and thermal capacities (= 1960° C., approximately).

Coal Gas with Theoretical Quantity of Air.

Composition of Gas.	Calorific Value per 100 Mol. Vols., Calculated from Figures in Table I.
H_2 . 54	54 × 58·2 = 3142·8 calories
CH_4 . 34	34 × 195·2 = 6636·8 ,,
C_2H_4 . 3	3 × 319·6 = 958·8 ,,
C_6H_6 . 1	1 × 753·6 = 753·6 ,,
CO . 6	6 × 68·2 = 409·2 ,,

100 molecular volumes evolve on combustion 11,901·2 calories.

Therefore 1 molecular volume develops on combustion 119 calories.

Products of Combustion (*see Table* II.).

Composition of Gas.	Oxygen Required.	Products from 100 Molecular Volumes.		
		CO_2	H_2O	N_2
H_2 54	27·0	..	54	..
CH_4 34	68·0	34	68	..
C_2H_4 3	9·0	6	6	..
C_6H_6 1	7·5	6	3	..
CO 6	3·0	6	..	..
100	114·5	52	131	..

Nitrogen from air . . . 114·5 × 4 = 458 vols.

Products from Gas.

	From 100 Mol. Vols.	From 1 Mol. Vol.
CO_2	52 vols.	0·52
H_2O	131 ,,	1·31
N_2	458 ,,	4·58

Products of Combustion per 1 Molecular Volume.		Thermal Capacities. 1800° C.	2000° C.	2200° C.
H_2O	1·31 molecular volumes	31·25	36·36	41·68
CO_2	0·52 ,, ,,	14·15	16·56	19·06
N_2	4·58 ,, ,,	65·08	73·51	82·02
Total		110·48	126·43	142·76

The heat of combustion of 1 molecular volume is 119 calories, corresponding with T = 1910° C.

Same Coal Gas Burning with 10 per Cent. Excess of Air.

The air necessary for the combustion of 100 molecular volumes of gas is five times the volume of oxygen = 114·5 × 5 = 572·5 molecular volumes; 1 volume of gas requires 5·72 volumes of air; and 10 per cent. excess is 0·57 volumes.

Products of Combustion. Molecular Volumes.		Thermal Capacities. 1800° C.	2000° C.
H_2O	1·31	31·25	36·36
CO_2	0·52	14·15	16·56
N_2	4·58	65·08	73·51
Air	0·57	8·10	9·15
Total		118·58	135·58

One molecular volume of gas gives 119 calories, which would raise the temperature of the products of combustion to 1805° C.

Table showing Maximum Temperatures attainable by the Combustion of Gases in Dry Air.

Gas.	Temperature. Deg. C.
Hydrogen	1960
Methane	1850
Carbon monoxide	2100
Water gas, theoretical (CO, 50; H_2, 50)	2030
Do., industrial (H, 51; CH_4, 0·5; CO, 42; CO_2, 4; N_2, 2·5)	2010
Coal gas of composition already given	1910
Do., with 10 per cent. excess of air	1805

The lecturer called attention to the fact that a high calorific value did not necessarily indicate a high flame temperature. He said it was well known that blue water gas, which had only about half the calorific value of coal gas, gives a hotter flame; the explanation being that the volume of the products of combustion from the unit volume of coal gas is much greater than in the case of water gas, on account of the larger volume of air necessary for combustion. The inert nitrogen in this larger volume of air was raised to the temperature of the flame; thus absorbing a considerable proportion of the heat. He added that the temperatures given in the table could not be attained in practice, without preheating the air or gas, for two reasons—first, there was always a loss of heat by radiation; and, secondly, the temperature was further limited by the partial dissociation of the products. The radiation losses in the ordinary bunsen flame varied greatly with the method of burning. If insufficiently aërated, the gases took from the surrounding atmosphere a large proportion of the air necessary for combustion, and the gases had to travel some distance before the required amount of oxygen had diffused into the flame, which consequently had a comparatively large area; whereas with more complete aëration a smaller, hotter flame resulted. The minimum size of flame, and consequently the maximum temperature, would be obtained by mixing the gas and air thoroughly in the proportions which would be necessary to ensure complete combustion, and causing the mixture to issue from the burner with sufficient velocity to prevent the flame striking-back.

The lecturer here demonstrated the method of measuring flame temperatures by means of a thermo-electric couple attached to a mirror galvanometer, and showed, by the movement of the spot of light, the varying temperatures of different parts of the ordinary bunsen flame. He then illustrated the shrinkage of the flame on increasing the air supply, and the consequent increase of temperature. The uniformly high temperature of the Mecker burner was also demonstrated. Having emphasized the fact that the flame temperature of a gas varies with the method of burning it, Dr. Gray referred to the results of the measurements of the temperature of the bunsen flame which were collected and published by Professor Smithells in his lecture to the Institution of Gas Engineers.* These results varied from 1630° C. to 1870° C. He reminded the audience that a fine platinum wire could be fused in a coal gas blowpipe flame, and that the maximum temperature attainable practically was consequently higher than the estimated melting-point of platinum—viz., 1780° C. He expressed the view that the discrepancies between the observed and calculated values were not greater than might be expected considering (1) the difficulty of measuring the exact temperature of a thin sheath of glowing gas, (2) the loss of heat due to radiation, and (3) the effect of dissociation. In connection with the last-named cause, he quoted Deville's work on the dissociation of water vapour, and gave the following figures, due to Le Chatelier, illustrating the dissociation of carbon dioxide:—

Degree of Dissociation.

Temperature.	Press. = 0·1 Atmos.	Press. = 1 Atmos.
1500° C.	1·7 per cent.	0·8 per cent.
2000° C.	8·0 ,,	4·0 ,,

Having explained how dissociation sets a limit to the temperature, the lecturer said its influence appeared to be very much less than was commonly supposed to be the case, if Le Chatelier's figures were correct.

* See "JOURNAL," Vol. XC., p. 685.

In conclusion, Dr. Gray pointed out that great reliance should not be placed on the accuracy of the calculated figures, on account of the uncertainty regarding the values of the thermal capacities at high temperatures; but he thought the figures would interest the members as an indication of what might be expected from gases of different compositions.

Discussion.

The PRESIDENT (Mr. James M'Leod) intimated that Professor Gray had very kindly agreed to allow the members to ask him any questions.

Mr. ALEX. WILSON (Glasgow) thought it would be out of place to attempt any criticism upon the excellent lecture to which they had listened; but he would just like to say how much he was indebted to Professor Gray for the very clear exposition of his subject which he had given. The language that had been used had been so simple that what he wanted them to understand must have come home to all. He thought the Council of the Association deserved credit in arranging for such a lecture. They had set an excellent precedent; and he hoped that next year the members would be favoured in a similar way. He begged to thank Professor Gray for the manner in which he had set forth his subject.

Mr. W. WILSON (Falkirk) said he had learned a great deal from the lecture; and he could only echo what had been said with regard to the simplicity of the language used by the lecturer.

Mr. H. O'CONNOR (Edinburgh) reminded the members of the great interest this particular subject had at the present time, in connection with the use of the incandescent mantle. It was the question of flame temperature far more than that of the calorific value of gas they had to think of; and it was the flame temperature which, in the high-pressure burners, gave off the higher quantity of light. Professor Gray had shown very clearly the rise of temperature when the flame was reduced in length by means of the increased pressure of air. They would have observed on the scale, in the experiment, that he obtained an increased temperature. This was what was found with the incandescent mantle in the high-pressure systems, because much greater heat was given to the mantle, and consequently they had a larger amount of light.

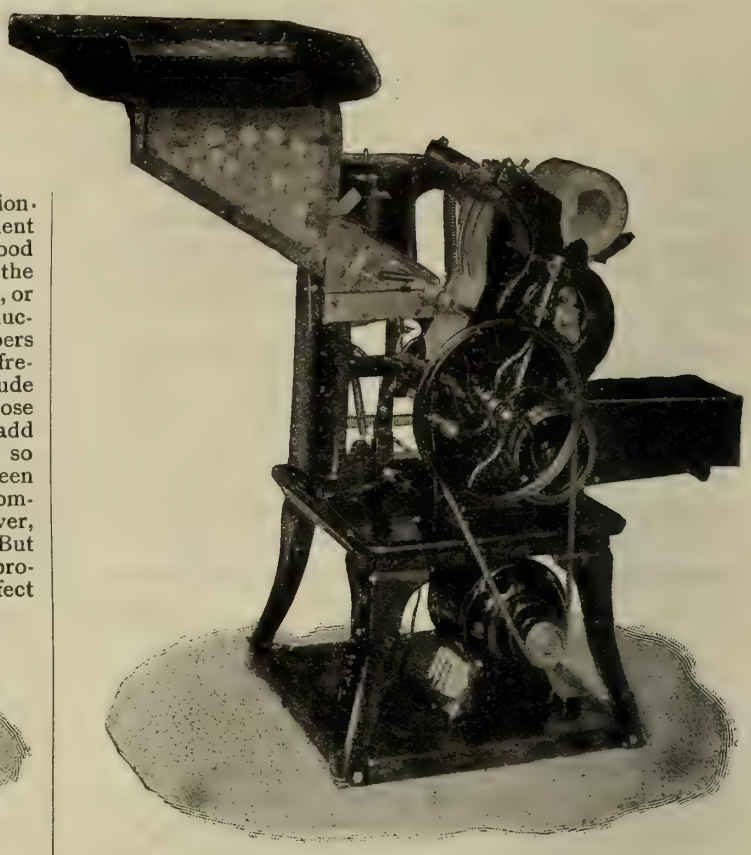
Mr. P. M'DOUGALL (Helensburgh) asked the lecturer what he considered the best way of producing a flame of maximum temperature at minimum cost.

The PRESIDENT added his thanks to those which had been offered. He said the subject was an extremely complex one; and Professor Gray had dealt with it, as they might have expected, in a very lucid manner. Its practical bearing had, of course, been brought out. He might just emphasize what had been said, by remarking that the question with the gas manufacturer now-a-days was to get as high a temperature as possible in his retorts, because this meant a higher percentage of hydrogen in the finished gas, and therefore a shorter flame, and consequently a higher temperature in the flame. In other words, gas would, in these circumstances, contain a greater percentage of hydrogen, less air was required for its combustion, and a greater flame temperature resulted.

Professor GRAY said, with reference to Mr. M'Dougall's question, that it was a point he was hardly qualified to speak upon, and possibly, if he were, he could hardly do so in the short time left. He could only say that the President had largely anticipated his reply. In order to have a gas of high flame temperature, the figures which he had given indicated that they must have a gas which used a comparatively small quantity of air. They must have the flame reduced in size, so that it would be intensely hot—a fierce flame. This was done, first of all, by regulating the quantity of air, and seeing that the gas and air were thoroughly mixed before being burned. Theoretically, the most intensely hot flame would be found by mixing the gas in the proportion necessary for complete ignition. Of course, in this case, the gas would explode, and the explosion would travel back and cause difficulty. They must prevent this by heating the gas and air. This was what was arrived at in the various systems of high-pressure gas lighting, in which the air, in certain proportions, was so mixed with the gas as to produce a small flame, which gave a high temperature on account of the area of combustion being reduced. This, so far as it could be stated in general terms, was his reply to Mr. M'Dougall's question. It only remained for him to thank the members for their cordial reception of his lecture, and also the gentlemen who had spoken, for the kind way in which they had referred to his exposition of the subject. He was afraid their thanks were somewhat undeserved, because he had not gone to all the trouble he might have done in converting the metric units into British thermal units. But it did not matter whether they dealt with molecular volume or cubic feet. They were relative terms, and they could all, by very simple arithmetic, convert any of the metric units into British thermal units.

Informal Meeting of Scottish Gas Managers.—Circulars have been issued by Mr. W. B. M'Lusky, of Perth, the Convener of the Informal Meeting of Scottish Gas Managers, intimating that the annual gathering is to be held in the Grand Hotel, Charing Cross, Glasgow, on Wednesday, the 3rd prox. The President for the year is Mr. J. W. Napier, of Alloa, who is to deliver his address at 1.30 p.m., after which there will be a discussion, followed by a dinner.

MECHANICAL COIN HANDLING.



The ever-growing use of the prepayment gas-meter system and the consequent ever-increasing collection of pence and shillings, have produced an additional volume of work that has, in most gas undertakings, necessitated the creation of a new department, with its special staff and accommodation. The total half-yearly or yearly collections from the prepayment meters are now mostly spoken of in thousands of pounds, and a good many thousands in certain instances; and calculations as to the tons of coppers that have to be handled in a week, in a month, or in six months now supply quite a popular "tit-bit" for production at the periodical meetings of shareholders. All these coppers or shillings require counting. It is a heavy task, requiring frequently several hands, expedition, and yet the utmost exactitude in both counting and bagging. The hands needed for the purpose (and the persons employed must be responsible and reliable) add to the expenses involved by the prepayment system; and so much has this been felt that the reduction of labour has been attempted by the invention of devices to automatically accomplish the counting. To the best of our knowledge, however, these inventions have only partially eliminated hand work. But now an inventive genius, after five years' experimenting, has produced a machine which will count and wrap coin with perfect



accuracy, and as rapidly, we should say, as five or six expert cashiers.

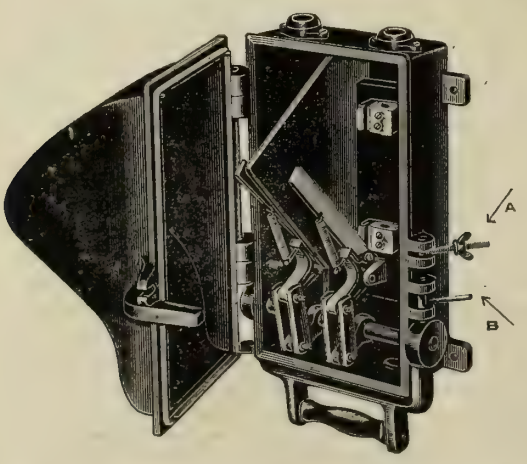
This device is to be seen at the offices of the British Coin Handling Machine Company, Limited, of No. 6 and 7, King William Street, E.C.; and the machine with which demonstration is made is arranged to count shillings, and wrap them up into rolls of fifty. Of course, the machine is constructed for any coin, and for any convenient numbers.

From a platform with raised edges at the top of the machine, the coins are fed into operating parts through a shoot, at the end of which they are assembled into line. Each coin, as it passes into line, is automatically counted, and the number of coins in line is shown on a dial. As the fiftieth coin (and if there are not fifty coins, not before the fiftieth one is supplied) falls into position, the roll of coins is gripped automatically, carried under a roll of strong paper and wound securely; each end of the roll being in the same operation beaded. It is impossible to remove a single coin without breaking the beading, which shows the completeness of, and cleverness represented by, the invention. The roll of coins, after being wrapped, is dropped into a receptacle, labelled with the denomination and amount, and, if desired, the title and address of the gas company or committee, as the case may be—the whole of the operations being performed at the rate of 400 to 500 coins per minute. The complete rolls of money with the neatly beaded ends, look almost exactly like cartridges, and, as already said, are so securely wrapped that it is impossible to extract a single coin without destroying the whole roll.

The machine can be adapted to deal with any coin, either copper, silver, or gold; and it is so accurate that each roll is a guarantee of its face-value; and, like a bank note, requires no counting. The machine is rather larger than a typewriter, and is actuated by a small electric motor of $\frac{1}{16}$-horse power; the cost of current being as low as 2d. or 3d. per day. As the only manual labour required is that necessary to keep the machine fed with coins, a boy or girl can work it. The expense is therefore almost infinitesimal. The machine is not completely wedded to electricity for its motive power; any other convenient power can be used, or, if preferred, treadle machines can be had.

Another very ingenious device that was inspected is an automatic cashier. This machine has a keyboard on the same principle as a typewriter, but each key is marked with amounts starting at 1d., and increasing by penny stages to 19s. 11d., with separate keys for sovereigns, half sovereigns, and half-pennies. The purpose of the machine is principally for wage paying where a large number of hands are employed. Coins of each denomination are placed in a grooved tray in the machine—one groove for each denomination. Then by simply pressing one or more keys separately or simultaneously, the sum required falls through a slot into the hand, bag, or any other receptacle. The mechanism is so constructed that it is impossible to pay either more or less than the amount designated on the key depressed; and if any denomination of coin is exhausted, the "cashier" is locked automatically as long as that particular denomination of coin is included in the sum to be made up, though the machine will deliver any other combination of coins which does not include the type that is exhausted. So long, therefore, as the right keys are depressed, it is impossible to make mistakes. The "cashier" can be re-charged in a few seconds. The utility of the machine to firms paying wages to a large number of hands is obvious, as, by using it, the whole wages can be paid by one operator in far less time than by the ordinary method. There is, in fact, no comparison. The machines are both time-savers.

A GAS AND WATER TIGHT ELECTRIC SWITCH.



Attempts have been made from time to time to produce an enclosed switch which would be suitable for use in collieries, or in places where there are explosive gases; but up to now these have not been successful. The weak point has usually been that, though the switch could not be put on until the lid was closed, there was no provision for ensuring that it was absolutely shut and was gas-tight. This and some other defects Messrs. Donovan and Co., of Birmingham, claim to have overcome by the simple yet effective means here shown.

The above is an illustration of one of the firm's patent 200 ampere, 500 volt, 6-inch switches. The lid is fastened down to a rubber gasket by means of the swivel bolt A, which engages the handle until a hole in the projection attached to the lid is opposite the bolt B, and allows the bolt to be thrown out of gear with the handle; thus leaving the switch free to be operated at will. The contacts of the switches are of Messrs. Donovan's registered design, the object of which is to obviate useless and inefficient contact surfaces, &c.; and the joints are arranged for easy connection to cables. The switch shown—numbers of which are, we are informed, in use in collieries and other places where explosive mixtures may be found—is fitted with gas and water tight glands.

The Metropolitan Water Board have increased the salary of the Comptroller (Mr. F. E. Harris) by £250 per annum.

Mr. Lynch White, J.P., of Leigham Lodge, Streatham, the Chairman of the Thames Bank Iron Company, who died a short time since at the age of 86, left £61,521.

MODERN GAS LIGHTING DEMONSTRATION IN CALCUTTA.

We are always glad to learn of gas-lighting successes in distant parts of the globe. The Oriental Gas Company have done magnificent service to Calcutta, with credit to themselves, by keeping absolutely up to date in introducing, through their energetic Engineer and Manager (Mr. J. C. Watson) and his capable staff who heartily second his efforts, the most modern productions of invention for the economical and efficient utilization of gas. It is part of the Company's policy, as it is of all enterprising undertakings, not to let any opportunities slip; and an opportunity of showing to Calcutta the splendour of the latest types of incandescent gas lighting was offered when the organization was mooted of what became to be known as Her Excellency Lady Minto's "Fête in Aid of Indian Hospitals." Mr. Watson was appointed to serve on the Lighting Committee; and his expert knowledge enabled him to render yeoman service in assisting to make the fête brilliantly attractive—his proposals receiving the cordial endorsement of his Chairman (Mr. R. Hesketh Jones) and the Board in London. The fête commenced on Jan. 28, and continued for nine days; shows being held afternoon and evening. The scene of the fête was the Maidan, which is in the central part of Calcutta, and is practically the Hyde Park of the city. It was a great show; and was exceedingly successful. Our last dispatched information says the official report mentions that the amount realized for charities has reached about £23,000,



The Gas Pavilion, and the Men who Did the Work.



One of the Avenues in the Fête Grounds by Gaslight.

which is certainly a very substantial sum considering the small European population of Calcutta.

The Oriental Gas Company's contribution to the fête was one which gave much gratification, and evoked much admiration. The exhibits, gas, labour, and everything attaching to the display were given freely, and without any restraint upon the liberty of Mr. Watson and his staff, who threw themselves into the matter with much enthusiasm both out of loyalty to the Company and from sympathy with the cause of the fête. They had a Gas Pavilion, illuminated one of the main avenues, and lighted the horticultural show and Lady Minto cottage, with the flower show annexe, photographic salon, telescope enclosure, "Shannon river," motor horse switchback, shooting galleries, refreshment rooms, &c., as well as the tea gardens, and the exit road and gateways. We reproduce a photograph of the Gas Pavilion, and of the gas-lighted avenue in the fête grounds—the Gas Pavilion being on the extreme left of the avenue. The latter photograph was taken by gas-light at between seven and eight p.m., in the time intervening between the afternoon and night shows, when the grounds were free from visitors. The Company exhibited lamps from 1000-candle power down to the bijou inverted burner giving 18-candle power per cubic foot of gas consumed—in fact, the opportunity was taken to show all the latest forms of gas lighting by compressed and low-pressure gas. In the photograph of the Gas Pavilion are seen the Keith and Blackman gas-compressor (No. 6 pattern); and the operating gas-engine. The compressor, Mr. Watson reports, worked splendidly. Then in front of the picture are seen six pneumatic lighters, by means of which, with half-a-dozen Welsbach burners at the back of the pavilion, it was demonstrated that, in convenience of lighting and extinguishing, gas (apart from its superior illuminating value for expenditure) can rival the electric light. The pavilion itself was lighted with two 600-candle power Keith lamps; and there were also exhibited (in addition to the range of gas-lamps from 1000-candle power down to the bijou inverted) specimens of mantle fibres, the details of mantle manufacture, and samples of rotary meters—in fact, most things modern in gas utilization that are suitable for use in India were on view. Visitors were all vastly interested; and the Company's attendants were inundated with inquiries.

One other interesting point about the Pavilion photograph. The Company's representatives who took part in the organizing of the gas-lighting part of the display were incorporated in the photograph. Looking from left to right, we have Mr. H. Park (of the meter and incandescent departments), Mr. A. G. Peters and Mr. C. Phillippe (of the main-laying department), then our old friend Mr. J. C. Watson (wearing his General Committee badge), Mr. L. G. Barber (Second Assistant), and Mr. J. Phillippe (outdoor foreman).

The residents of Calcutta visited the fête in large numbers, and so the Gas Company obtained what must be described as a splendid advertisement. The lighting was greatly admired; and the local Press gave it much merited praise. The "Indian Daily News," as one example, remarked: "The lighting of the grounds was superbly done." No pains were spared to earn this verdict. Those who had taken part in making the fête attractive and a success were most warmly thanked by Lady Minto. Her

Excellency was good enough to express to Mr. Watson her thanks for what the Company did for the success of the show, and for the laudable object for which the fête was instituted. Similar acknowledgment of the Company's services was made in the official report. A souvenir which Mr. Watson will always value very highly was also presented to him by Her Excellency. We congratulate the Company and all concerned in this demonstration.

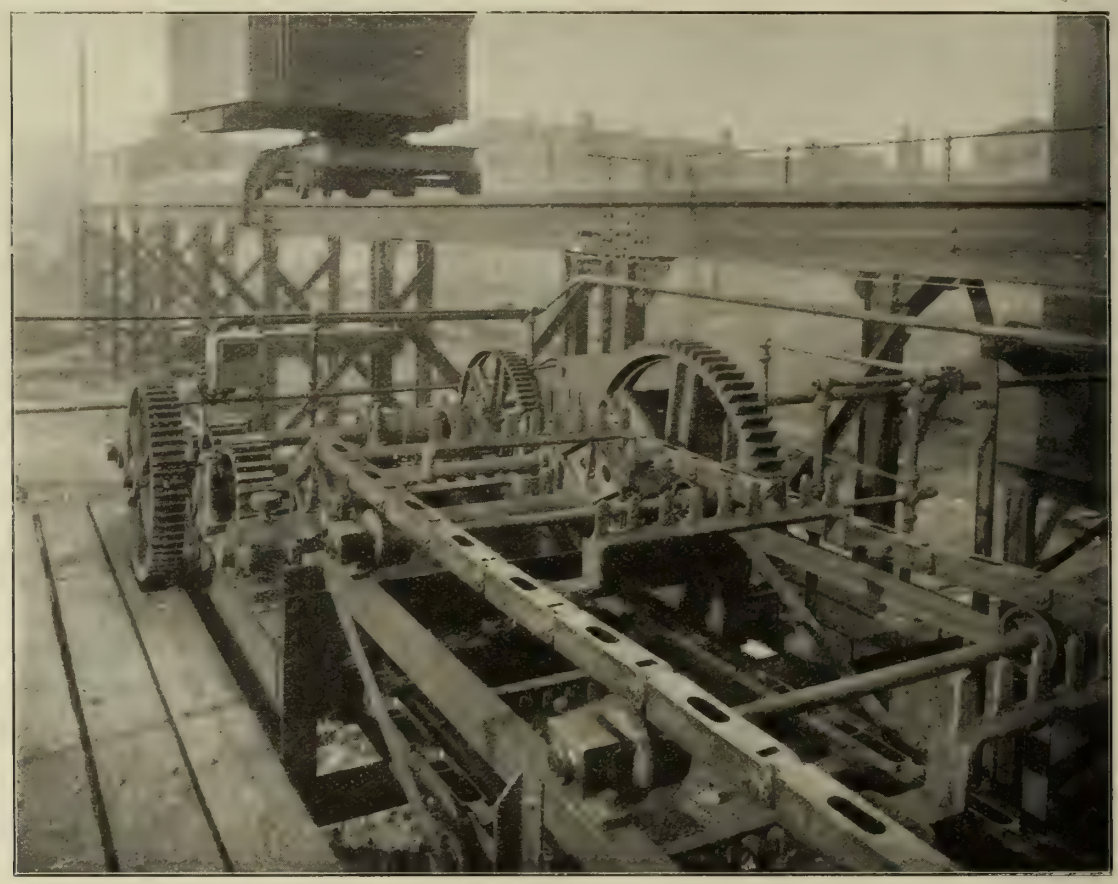
ELEVATORS AND CONVEYORS.

By H. J. Toogood.

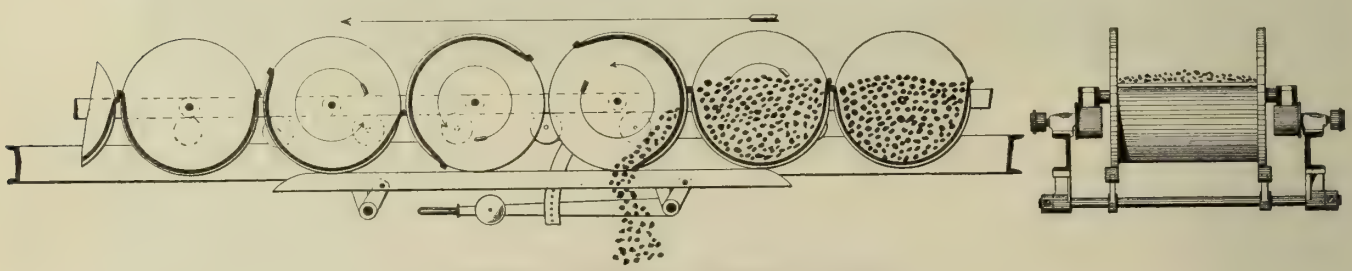
In the paper on the above subject read by Mr. W. B. Leech at the recent meeting of the Eastern District Section of the Scottish Junior Gas Association, the author referred to the disadvantage of hexagonal and polygonal driving-drums as used in connection with conveyors and elevators. He also gave particulars of an improved form of tipping gear for gravity bucket conveyors. Readers of the "Journal" may be interested to learn how these problems are being met by other specialists in the economical mechanical handling of material; and therefore I send a few remarks and two illustrations showing the application of two recent improvements in conveyors, &c.

With reference to the hexagonal driving-drums, it is a well-known fact that when such drums are revolving at a uniform rate, the motion which they impart to the chains partakes of a series of jerks or fluctuations in speed—the amount being, of course, entirely dependent on the number of sides to the polygonal drum. With a hexagonal drum, the fluctuation amounts to 15 per cent. One can readily imagine the excessive strain brought to bear on the whole of the pin-joints of the chains, &c.; and in the case where an electric motor is directly coupled to drive the conveyor, it must of necessity be very severe on the motor, as these pulsations would occur every half-second.

To overcome this, the writer has designed an arrangement of spur-gear drive, whereby power at a constant speed of rotation



Toogood's Patent Compensating Gear for Conveyors and Elevators, as Applied to the Stockport Hot-Coke Conveyors.



Toogood's "Tippit" Gravity-Bucket Conveyor.

(viz., an electric motor) is transmitted through the two eccentric spur-pinions in such a way that the hexagonal drums receive an ever-changing rate of revolution exactly in opposition to their original tendency to fluctuate the speed of the chains. The result of this arrangement is that the conveyor is pulled forward at a continuous and uniform rate; the whole of the gearing, chains, and motor being thus relieved of the shocks already alluded to, with evident advantages.

The patent was fully described and illustrated in the "Journal" for Nov. 1 and Nov. 8, 1904.

It is interesting to note that no special wheels are employed; all wheels being of plain, ordinary, spur-gear—the only departure being that the pinions are keyed eccentric to their respective shafts.

An application of the gear is shown driving a hot-coke conveyor, from which the simplicity of the gear is evident, and also its adaptability to any type of conveyor or elevator.

Having reference to the tipping mechanism for lipped gravity bucket conveyors, the experience of users in the past has been that the oscillation of the buckets causes the lips to collide one with the other, and this has resulted in breakage of the lips. The conveyor that I invented some time ago, and is here described, is a radical departure from previous designs of gravity bucket conveyors, inasmuch as nothing is left to chance, as each bucket is inverted—thus with certainty discharging its contents (whether it be coal, coke, lime, or oxide, in any condition, wet or dry), and then quietly and steadily continuing the revolution until the bucket comes to rest without shock or jar. Furthermore, the shape given to the bucket, while obviating the necessity for a pair of cams secured to each bucket, also permits of a greater cubical capacity being contained by each bucket. In fact, there is quite 30 per cent. more capacity than in an ordinary shaped bucket of similar over-all dimensions—thus permitting the same bulk of material to be handled in the same time, with less speed on the conveyor, with consequent reduction in wear and tear. Another feature is that, instead of the chain carrying the rollers, the position is reversed. The rollers carry the chains, with evident benefit, since their dead-weight is not being conveyed continuously.

The sole right of exploiting these improvements is vested in Messrs. Robert Dempster and Sons, Limited, of Elland, Yorks.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Public Lighting.

A Meeting of the Association was held on Wednesday last, at the Cripplegate Institute, E.C., under the presidency of Mr. W. Upton, who at the commencement of the proceedings announced two attractive fixtures. On Tuesday, the 9th prox., the members have been invited to pay a visit of inspection to the works at Luton of the Davis Gas-Stove Company, and also to the Luton Gas-Works; while arrangements have also been made for a "scientific-social" evening (which promises to be a most successful function) to be held in the large hall at the Cripplegate Institute on Saturday, May 4.

The paper submitted to the members last Wednesday was a lengthy, and highly practical one—on "Public Lighting," by Mr. E. W. Eldred, of the Gaslight and Coke Company. It was divided into two parts—the requirements of public lighting, and the means by which these requirements are carried out. The author pointed out that if a lamp was fixed in a country road, all that was needed was that it should light up the different turnings and obstructions, so that they could be seen from both ways of approach. With what he termed "suburban" roads, however, he laid down the following rule for the distances lamps should be fixed apart. Other than busy main roads: For a 40-feet roadway, lamps to be 30 yards apart; a 30-feet roadway, 35 yards apart; and a roadway under 30 feet, 40 yards apart. Busy main roads: For a 50-feet roadway, lamps to be 20 yards apart; and for a 45-feet roadway, 25 yards apart. The distance between each lamp is, of course, measured along the centre of the road. In all suburban roads, the corner lamps should have twin burners; and all lamps in the busy main roads should be so fitted. The burners need not in any case consume more than 4 cubic feet per hour. The use of double-burner lamps at corners, he pointed out, made it possible to do away with refuge lamps, which were a nuisance, and should be very sparingly employed, especially as motor traffic was so largely on the increase. For the principal town and city roadways, the following rules were laid down for distances apart of lamps, &c.: Side turnings, same distance as for suburban roads, but larger burners. Up to 60 feet roadways, lighted from footway, twin No. 4 burners parallel to roadway, lamps 20 yards apart. From 60 to 80 feet roadways, one line of refuge columns down the centre 30 yards apart; 200 to 300 candle power self-intensified lamps and single burners on the footway in between. From 80 to 90 feet roadways, one line of refuge columns down the centre of the road, 30 yards apart; 400 to 500 candle power self-intensified lamps, and twin burners on the footway. From 90 to 100 feet roadways, a double row of refuge columns placed alternately 30 yards apart; 500-candle power self-intensified lamps, and twin burners on the footway in between. Lamp-columns should never be placed opposite each other. Suitable heights for different columns were: For 200 to 300 candle power lamps, 12 feet; 400 to 500 candle power, 14 feet; 600 to 800 candle power, 16 feet; and 900 to 1000 candle power, 18 feet—the light being about 2 feet higher in each case.

Coming to the second part of his subject, Mr. Eldred said that in the case of country roads a No. 3 size cast burner was the best. The light was sufficient, and the burner would not require much attention. For suburban roads where there was a certain amount of reflection from the houses, the same burner would do, with twin burners at all corners and open spaces; but in main-road busy thoroughfares No. 3 twin burners should be used throughout. For all central lighting, such as squares, self-intensified lamps should be employed. The lanterns should be of part copper and part tin. There was no advantage gained by expending a lot of money on all-copper lanterns; and should improvements come along, there would be less to scrap in the first case than in the second. They should be so constructed that the cold incoming air went down on the inside of the glass, and did not come in contact with the hot air rising from the burner; and they should be wind and rain proof. The reflector should be of the very best porcelain; enamelled iron being tabooed as the worst enemy of street lighting. In town and city roads, the side turnings should have No. 4 single burners, with twin burners at the corners; the main roads, twin No. 4 burners; and at special spots self-intensified lamps. For thoroughfares that needed special treatment, and it was a question of high-pressure or self-intensified lighting, he preferred the latter (except where there was a high-pressure main), for the following reasons: Economy in capital outlay; economy in maintenance; each self-intensified lamp was an independent unit, and if one failed the danger to traffic was but slight, whereas with high pressure when used with an apparatus the danger of failure was ever present. Then, again, the efficiency in candle power per cubic foot was in favour of the self-intensified lamp; and he thought that it had more chance of being adopted, as the borough authorities were becoming more alive to the fact that the only way to secure uniform lighting of the streets was by small units at close quarters. There was also, of course, the consideration of cost. There was a self-intensified lamp coming along that would be guaranteed as to its durability and reliability, and that would give an efficiency of from 35 to 40 candle power per cubic foot. It could be fitted to existing electric light columns or to ordinary lanterns. As to the best system of high-pressure lighting, he had yet to be convinced that it was necessary to work at a higher pressure than 20 inches. In his opinion, from 8 to 20 inches was ample, and was the most economical pressure. If there was a high-pressure main running through a thoroughfare, it should be made use of, for it would then naturally be the cheapest and best method of lighting. But all high-pressure systems, when worked by apparatus, should be able to go on to low pressure and give a fair light in case of any breakdown.

Mr. Eldred next referred to the tables of comparison as to the candle power and cost of electric light, high-power lights with auxiliary pressure apparatus, and self-intensifying gas-lamps, prepared by Mr. James Foreman, in connection with a paper read by him before the North of England Gas Managers' Association last April [see "JOURNAL," Vol. XCIV., p. 310]. He remarked that gas was easily first, and that the Scott-Snell system obtained the best result, both as to efficiency and economy. Following this, the subject of burners was touched upon. All burners, said the author, should be of heavy make; and he preferred a cast No. 3 to a "C." When, however, the latter was used, an 8-inch chimney should be fitted. An 8 in. by 2½ in. chimney to fit a "C" burner was an exceedingly useful type, and was more economical than the ordinary straight-up-from-the-gallery type; the breakages were considerably less. The glass should be just within the hole of the reflector, which would enable the light to be higher in the lantern. To his mind, the best results from the light were obtained when it was not less than two-thirds up in the lantern—in other words, the nearer the reflector the better the distribution of light. The glass having been so fitted that it was just within the hole of the reflector, an intensifying action would be set up in a minor degree, which would have an excellent effect upon the light—not only increasing its efficiency, but producing a steadiness that was frequently missing in a "C" burner. This arrangement necessitated a bye-pass, which he regarded as quite an advantage. Cast burners should have at least a 6-inch chimney, and be placed high in the lantern, with a bye-pass. The Kern burner, he roughly estimated, cost twice as much for maintenance as a cast burner; and a "C" burner slightly less than a Kern. The Kern undoubtedly gave a higher efficiency at the start; but the decrease was considerable after a little while, whereas a cast burner as a rule would maintain a general efficiency—which after all was far better for public lighting.

The author said he did not advocate anti-vibrators in any other than exceptional circumstances; but whatever pattern was used, it was no good if it allowed the burner-head and the mantle to vibrate from side to side. The lateral vibrations it was that so quickly destroyed mantles; and the point was to transform them into vertical ones, where they would do least harm, and were best taken up. Governors should be changed not less than twice a year. Frequently burners were condemned for firing-back, when the seat of the trouble was that the governor was sticky, and worked stiffly. Under the present conditions of the manufacture of gas, he considered the diaphragm governor the best to use. As to the question of open frogs or cast bases, he preferred the open frog and glass bottom lantern. It was cheap, and threw but a small shadow, which was split up; while the cast base was very costly, and threw a dense shadow all round the base of the column. The point brought forward by the supporters of the cast base, was that it maintained everything perfectly rigid; but if the frog and standpipe were properly wedged, and there was a slight play between the spindle of the cock and the hole in the base of the lantern, the efficiency of the whole was as great as that of a cast base, without all its attendant expense and intricacies. It was difficult as yet to criticize inverted lamps, as they were only in the experimental stage. The instance so freely quoted—of an installation in a country place, where flat-flame burners were taken out and inverted burners put in the ordinary lamps—would, of course, show good results; but what they had to do was to improve upon the existing installations of incandescent lighting, and this was still in the experimental stage. He was, however, firmly convinced that it would be an improvement which would show a higher efficiency at less cost.

Maintenance was the next matter dealt with; and with regard to this, Mr. Eldred said there were three points to be borne in mind—efficiency, speed, and economy. Efficiency meant that the men attending to the lamps must know what to do and how to do it; and therefore the men must be well instructed. By speed, he did not refer to the rapidity with which a man could rectify a defective light or burner, but rather how long after lighting up it was before every lamp was in good order. Economy covered the materials used in renewals of all kinds to burners, mantles, &c., and also special maintenance wages. His idea of the best way to maintain lamps was, first and foremost, to make all men responsible for their own particular lamps in every way; individual responsibility was the key-note of his ideal system. He would have one man to an average of eighty lamps for maintenance; and as he would be responsible for his own work, he would see that it was all right before he started lighting, so that when he had finished lighting he ought very seldom to have to go back on to his work again. He would arrange for the men to come back over some of their own ground again, and all to look out for anything amiss; and in the manner he had sketched, the maintenance would be completed on an average about 15 minutes after lighting up every night. To his mind, all the lamps should be maintained at the highest point of efficiency whatever the cost; but at the same time the cost must be kept down as low as possible. To do this, one must know the number of lamps and burners and the quantity

of mantles used by each man, and so keep a check upon him. Under the system outlined, there would not be any special maintenance men, and therefore no extra wages, as each man would have to do his own maintenance. When they found a mantle that was strong and gave a good average light, they should stick to it, but frequently test it on the photometer, and if it showed any falling off either change it or get it improved. Shocking machines he did not consider much use; the mantle average was a far better test, and more satisfactory to all concerned. Comparisons had been made of the cost of maintenance on the Continent and here; and he had come to the conclusion that in London at all events the same good results could not be secured owing to the excessive moisture and condensation, that helped so much to shorten the life of mantles and to corrode burners of the Kern and "C" type, necessitating far more frequent attention than would be necessary in a drier atmosphere.

In conclusion, the author gave a description and a practical demonstration of the Rostin and the Alder and Mackay automatic lighting and extinguishing systems, which were referred to and illustrated in Mr. S. O. Stephenson's paper read recently before the Midland Association [see *ante*, pp. 604-609]. He pointed out that the requirements of London and the methods of distribution by which it was served, were unique; so that the question of automatic lighting by pressure needed very careful thinking about. Taking everything into consideration, he thought that an apparatus that worked with an extra pressure of 1-10th or 2-10ths was required for London, though where the conditions suited the Alder and Mackay apparatus (which could only be worked at a minimum extra pressure of 5-10ths, while the makers preferred more) he imagined it would prove satisfactory as well as a good deal cheaper. The convenience of an automatic arrangement was great, and maintenance with one in use was more economical; so that he believed the plan would become pretty general as time brought experience and improvements.

After the author had sat down, some comments were made, and questions asked, by the members. The President remarked that he noticed Mr. Eldred said the use of double-burner lamps at corners made it possible to do away with refuge lamps, which were a nuisance; and then later on he suggested for 60 to 80 feet roadways, and wider, a line of refuge lamps down the centre of the roads. This seemed a contradiction. As to the advocacy of part copper and part tin lanterns, it should be remembered that after lamps had been up for some time tin-work was no good for scrapping, whereas copper was always worth its weight as a metal. Mr. Tooth referred to the author's statement that, while the Kern burner undoubtedly gave a higher efficiency at the start, the decrease was considerable after a time, whereas a cast burner as a rule would maintain a general efficiency; and he said he would be glad to know why the efficiency of the Kern dropped. To his mind, the Kern was the most perfect low-pressure burner of the present day, though as regarded maintenance no doubt it was a mantle waster. Mr. Winslow inquired what self-intensified lamps the author had had experience of. He said that most unfortunately at Walthamstow the Council had their own electric light installation, and so what few gas-lamps there were had to look after themselves. On these few gas-lamps the Council had "C" burners; and they had tried to cut down the light to more or less equal that of the electric lamps. They put 3 feet governors on the burners, which, of course, required 4 feet, and so reduced the candle power by something like 50 per cent. They next fitted specially short mantles, to suit the flame given by this 3 feet. People who did not know that the Council maintained the gas-lamps put the result down to the Gas Company; and so it was not a very good advertisement. He could not see himself where "the ever-present danger" would come in with high-pressure lighting. Mr. Grimwood remarked that the author seemed to have had good results from the Scott-Snell lamps; and he asked why they were displaced in Whitehall. The President said Mr. Eldred had taken up what he assumed to be a model position, and had stated that the result of the system he advocated would be that "the maintenance would be completed on an average about 15 minutes after lighting up every night." Was this a model case, or was it actual practice? If the latter, he thought it was exceedingly good work. From personal observation, he had noticed that more often than not it was an hour after lighting-up time before maintenance was completed. Did the author know of any place where 15 minutes' allowance, or about that, was a working proposition?

In replying to the discussion, Mr. Eldred pointed out that when first mentioning refuge lamps, he said that the necessity for them would be obviated by having double-burner lamps at corners. In city roads, however, traffic was not allowed at an excessive speed; and the matter was different. In the former case, refuge lamps should be done away with; but in city roads with an immense traffic, it was necessary to have them. They should, however, be so placed that there was room for two lines of traffic in either direction. The time he had mentioned for maintenance—15 minutes—might perhaps appear to be a little far-fetched; but he had had a special average got out for the last four weeks, during which there had been a particularly high wind. This average worked out to 7 minutes—not 15 minutes. The reason for the deterioration of the Kern burner was that the condensation was so great with the air of London that it corroded not only the tooth-wheel, but the inner cone as well. He had had to keep a pair of fitters continually on the move throughout his district filling in their time attending to maintenance of the Kern burners. When referring to No. 3 burners, he did not mean the No. 3 Kern, but a cast burner—that was, a Sugg, a Bray, or an Edgar. He did not know why the Scott-Snell lamps were displaced in Whitehall; but he put it down to the fact that the Sugg system was there and partly in operation before, and so it was merely an extension. This, however, was purely supposition on his part.

On the proposition of the President, a very hearty vote of thanks was accorded to Mr. Eldred for his paper.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Under the chairmanship of the PRESIDENT (Mr. G. W. Fligg), the members of the Association gathered at the Municipal Technical College, Bradford, on Saturday, to hear the two papers read which are given below.

Mr. E. J. SUTCLIFFE read the following paper entitled—

HYGIENICS OF THE GAS-STOVE.

"It is admitted that perfect combustion is possible with a properly regulated flat-flame burner. Are not the products of combustion from a properly made blue flame identical, and therefore is not the general impression that a blue-flame stove should have a flue connection, and that such a connection is unnecessary for a luminous flame stove, erroneous?" This was one of the questions sent out to the members last year; but, though two afternoons were devoted to the list, it was not reached. The discussion of this particular point appeared, from conversation I had with a few members, to be anticipated with some interest; and I therefore promised to give a paper on the subject, but somewhat regretted having done so, when almost the first article upon the question as to which was the best flame for heating purposes that I read in the "JOURNAL OF GAS LIGHTING" stated: "Whoever attempts to write critically upon gas-stoves without knowing all that has been written and done for the elucidation of this point by truly scientific workers, is to this extent unfitted to his task." [Vol. 62, p. 1032.] This remark set me to work hunting up every available article which bore any reference to the subject; and it is almost unnecessary for me to state that the value of the experiments by experts which are quoted is far greater than would have been that of any which I might have made in support of my contentions.

There are three different ways in which gas may be burnt: (1) For light, in which the gas is not supplied with any air before it reaches the point of ignition, but on reaching this point is furnished with sufficient for its complete combustion. Here there is a luminous flame. (2) For heat, when the gas receives, and is mixed with, a partial supply of air previous to ignition; the remainder necessary for complete combustion being supplied at the point of ignition. Here the flame is blue or greenish blue and non-luminous. The great heat of this flame is now utilized by means of the Welsbach mantle to afford light also. (3) For power, in which the gas is, before ignition, mixed with sufficient air for its complete combustion; and there the combustion is so rapid as to make an explosion. This method, however, does not enter into our deliberations to-day.

When coal gas is burned completely, the products of combustion consist of carbonic acid, water vapour, nitrogen, and (if any sulphur be present in the gas) sulphurous acid. If even ordinary ventilation is provided, no ill-effects would result from the liberation of these products in a room; but if from any cause combustion is rendered imperfect, carbon monoxide, acetylene, marsh gas, carbon, and hydrogen may be found to be given off in considerable quantity.

In the question, it is admitted that perfect combustion is possible in a luminous flame; and such an admission was borne out by the Commission appointed by the "Lancet" in 1894 to report upon the hygienic value of gas for cooking and heating purposes. This Commission reported, among other things, that with a Bray's batswing burner, burning 6 cubic feet per hour, no distinct evidence of undesirable products in the burnt gas was found, though there were slight indications of carbon monoxide; while the presence of even a trace of acetylene was "doubtful." [J.G.L., Vol. 65, p. 123.] Lewis T. Wright has put on record the fact that,

> On two different occasions, he has sought for and endeavoured to find, traces of unconsumed gas escaping from the normal flames of ordinary gas-burners, both lighting and non-luminous. . . . The results were in every case negative; and not the slightest trace of carbon dioxide formed by the oxidation of carbon monoxide or of other products of unconsumed coal gas could be detected.

His method of testing was as follows:—

> The burners were placed in a small room, the air of which was tested in order to ascertain that there were not present any carbon compounds (escaping coal gas) that would give the reaction sought for. A tube was placed over the flames, but not so as to touch them; and the products of combustion, mixed probably with some air, were drawn through vessels containing cotton-wool to remove dust, organic matter, &c., and then through a column of soda-lime to remove the carbon dioxide. The gases so purified were afterwards passed over copper oxide that had been prepared *in situ* by the oxidation of fine copper wire, and then through bulbs containing lime water. [J.G.L., Vol. 66, p. 1024.]

From tests made on batswing and argand burners under the direction of Dr. Bunte, that eminent chemist is satisfied that

The ordinary gas-flame under normal conditions yields no quantitatively determinable amounts of products of incomplete combustion. [J.G.L., Vol. 66, p. 179.]

In 1895, Professor Gellmuyden, of Christiania, published the results of some experiments he had conducted; and from these, he concluded that,

With a slit burner or an argand burner, there are no hydrocarbons or carbon monoxide liberated on combustion. [G.W., Vol. 23, p. 12.]

In last year's "Question-Box" of the Ohio Gaslight Association, the following question was asked: "Is perfect combustion possible with a perfectly regulated illuminating or flat-flame burner?" Out of nine answers, seven were affirmative.

Against all this evidence, Professor Lewes has stated that

The gases leaving the luminous flame show that the diluting action of the nitrogen is so great that considerable quantities even of the highly inflammable and rapidly burning hydrogen escape combustion; while the products of incomplete combustion are present in sufficient quantity to perfectly account for the deleterious effects of gas-burners in ill-ventilated rooms.

He arrived at this conclusion after

Taking a small platinum pipe with a circular loop at the end, the interior of the loop being pierced with minute holes; and by making a circular flame burn within the loop so that the non-luminous zone of the flame just touched the inside of the loop, and then by gentle aspiration withdrawing the gases escaping from the outer zone and analyzing them.

The following were the figures he obtained with a luminous flame: Nitrogen, 76·612; water vapour, 14·702; carbon dioxide, 2·201; carbon monoxide, 1·189; oxygen, 2·300; marsh gas, 0·072; hydrogen, 2·388; acetylene, 0·036. [J.G.L., Vol. 56, p. 1335.]

On another occasion he stated that a luminous flame consists of three parts—the inner zone, the luminous zone, and the

Extreme outer zone, in which the cooling influence of the entering air renders a thin layer non-luminous, and finally extinguishes it. With an ordinary coal-gas flame, this results in the escape of traces of hydrogen, methane, acetylene, and carbon monoxide; while with a very rich gas, unconsumed carbon also escapes. [J.G.L., Vol. 59, p. 797.]

Though it may be presumption for me to criticize Professor Lewes's conclusions or his methods, it appears to me that the Professor would have been justified in drawing the conclusion he did if in his experiments he had collected the gases from just outside the outer zone of the flame, instead of having his flame "just touched" by the inside of the loop of the pipe through which the gases were aspirated; for there would be great danger of the gases being withdrawn from a part of the flame where combustion was not complete. And, again, the fact that the tube touched the flame is, to my mind, sufficient to vitiate the conclusions at which he arrived; for, in his own words,

It is the contact of the body to be heated with the flame before combustion is complete, that gives rise to the mischief. Any cooling of the flame extinguishes a portion of it; and the gases present in it at the moment of extinction creep along the cooled surface, and escape combustion. . . . It is impossible to check the flame anywhere short of the extreme tip without liberating deleterious products. . . . Even in the extreme tip of a luminous flame, it is impossible to heat a cold body without giving rise to carbon monoxide. [J.G.L., Vol. 56, p. 1336.]

Many years ago, experiments were conducted by Landolt in Bunsen's laboratory, under the direction of that great chemist himself, upon the gases in the various parts of a rat-tail flame. In order to collect the gases at the different parts of the flame, a very fine suction tube was placed vertically in the axis of the flame, which was 100 mm. high; and it was found that the small amount of suction necessary to draw the gases through the apparatus reduced the height of the flame 10 mm.; that it was impossible to continue the investigation on the composition of the flame gases beyond a height of 55 mm. above the burner-head, because of the deposit of free carbon; and that the fine wire passed through the suction-tube to clear it of the carbon caused inconvenient deformation of flame. [J.G.L., Vol. 66, p. 1023.]

This is further evidence in support of my contention that in Professor Lewes's experiments the gases he withdrew were not only withdrawn before combustion was completed, but also that his method of taking off the gases interfered with perfect combustion, and completely vitiate the conclusions he drew from his experiments. The bulk of available evidence therefore appears to me to be in favour of the possibility and probability of perfect combustion taking place in coal-gas luminous flames. When coal gas is burnt completely with a blue or atmospheric flame, the products of combustion are identical with those of the same gas when burnt completely with a luminous flame. The point as to whether perfect combustion is attained in atmospheric burners in ordinary practice will now be considered.

Mr. Lewis T. Wright has already been referred to when I gave the negative results of his experiments made in order to discover products of incomplete combustion from both luminous and blue flames. He repeated his experiment with large bunsen flames, in which the proportion of air primarily admitted was so large as to approach the point at which the flame would light-back; but again he got negative results. [J.G.L., Vol. 66, p. 1024.] The "Lancet" Commission, also alluded to previously, applied some very stringent tests in order to ascertain the presence or absence of carbon monoxide or acetylene in the products of combustion from a number of Welsbach burners. Their findings are summed up in the following sentence:—

Even when the gases were aspirated for hours straight from the chimney of the Welsbach burners, neither of the gases carbon monoxide or acetylene could be detected. [J.G.L., Vol. 65, p. 123.]

Dr. Bunte had made, under his direction, tests of the combustion products from ten incandescent burners, an argand burner, and a hollow-top batswing burner (the experiments being conducted in a manner somewhat similar to those of Mr. Wright already described); and he found that,

Calculating into percentages of carbon monoxide in the undiluted exit gases, in most cases the amount was expressed in thousands of a volume per cent. only; and consequently it was within the limit of experimental error. Therefore the combustion must be regarded as perfect with these burners. . . . "The incandescent burner, under normal conditions, yields no quantitatively determinable amounts of products of incomplete combustion." [J.G.L., Vol. 66, p. 179.]

In his lecture upon the bunsen flame, given at our inaugural meeting in 1903, Professor Smithells said:

Neither the bunsen flame burning freely in the air, nor a flame of a properly-constructed burner giving a luminous flame, yields products of imperfect combustion to any appreciable degree. [Yorkshire Junior Gas Association Report, p. 9.]

Here, again, Professor Lewes has pronounced against the possibility of complete combustion; for he gives the following as the composition of gases taken from a bunsen flame by the same method as that described in his analysis of gases from a luminous flame: Nitrogen, 80·242; water vapour, 13·345; carbon dioxide, 4·966; carbon monoxide, 0·006; oxygen, 1·430; marsh gas, 0·003; hydrogen, 0·008. He says:

The air penetrating the flame so dilutes and cools down the outer layer of incandescent gas that it is rendered non-luminous; while some of the gas sinks below the point at which it is capable of burning, with the result that considerable quantities of the products of incomplete combustion (carbon monoxide and acetylene) escape into the air and render it actively injurious. Though the dilution of coal gas by air in atmospheric burners is sufficient to prevent the decomposition of the heavy hydrocarbons with the liberation of carbon, and so destroy luminosity, yet the presence of an extra supply of oxygen does make the combustion far more perfect, so that the products of incomplete combustion are hardly to be found in the escaping gases. [J.G.L., Vol. 56, p. 1335.]

My objection to this is the same as that previously levelled against the Professor's tests on luminous flame products; for he himself has said:

With all stoves in which solid bodies like asbestos are heated by atmospheric burners, a trace of carbon monoxide is produced. [J.G.L., Vol. 80, p. 1621.]

But in this case, the carbon monoxide, marsh gas, and hydrogen are present in such small quantities as to be almost within the limits of experimental error. In subsequent papers and lectures by Professor Lewes, I cannot discover any further reference to these experiments. Yet five years later than the date at which he published these results, I find him saying, in speaking of the two distinct flames of a bunsen burner:

The outer flame is produced by the combustion of the hydrogen and carbon monoxide escaping from the inner zone into the completed products of combustion—carbon dioxide and water vapour. [J.G.L., Vol. 68, p. 1125.]

No mention is made of combustion in the outer zone being incomplete. In his paper to the Gas Institute in 1895, he said:

The only way to get complete combustion is to allow the (atmospheric) flame to burn itself out without contact with any other body. [J.G.L., Vol. 66, p. 21.]

I therefore gather from these later statements that Professor Lewes has changed his mind somewhat since 1890, when he published his figures as to incomplete combustion taking place in blue flames; and I think it must be conceded that the weight of evidence is against the idea that gas burnt freely in air by either good luminous or blue flames gives off products of incomplete combustion. Where these products have been found, the experiment itself should be above criticism; and blank experiments ought first to have been made, in order to prove that the minute quantities found were not present in the air of the room. In my opinion, therefore, the first half of the question must be answered in the affirmative.

The second half brings into play another set of circumstances which has not been considered hitherto; and all these must be taken into account before the question can be answered satisfactorily. The luminous flame which we have previously discussed is one in which the burner, the gas, and the air supply are under direct supervision, and are just what are necessary to each other in order that combustion may be perfect; but when the same burner and gas are used for heating purposes, new conditions, which alter the circumstances altogether, often prevail.

Chief among the disturbing influences may be mentioned: (1) Too great a pressure of gas. Here, the gas rushes out into the air at such a rate as to produce a partial vacuum near the burner orifices, and the air is drawn in and mixes with the gas, cooling and diluting it so much that it burns with a bluish flame, giving little light. Perfect combustion under such conditions is impossible. In argand burners, the flame gives off free carbon. (2) When the gas is turned too low, the flame frequently gives off free carbon. (3) Draughts from open doors are often the cause of imperfect combustion. Excessive draughts or back-draughts

from the flues of stoves have a similar effect. (4) In stoves in which the luminous flame is used, the burners are often fixed in a position out of the vertical. This will cause air-currents to play unevenly on the surface of the flames, with separation of free carbon, &c. One at least of these disturbing influences generally comes into play in luminous-flame heating-stoves in which the heat available is reflected or radiant; and as the burners are often, if not generally, placed out of sight, it passes unnoticed. Though I hold the opinion that in the majority of rooms the ventilation, either provided or accidental, is sufficient to remove the small quantity of injurious products given off without ill-effects on the occupants, it would remove all possible cause for complaint if a flue were provided.

When we come to look at the use of atmospheric burners for heating-stoves, still other conditions come into force. When applied to heating-stoves, the blue flame is generally used to heat asbestos balls, iron fretwork, or some similar material, in order to radiate heat, and also to imitate the glow of a coal-fire. As has been previously pointed out in speaking of Professor Lewes's tests on the combustion products from bunsen burners, when cold substances such as those named are introduced into the blue flame, they interfere with combustion, and the carbon dioxide and water vapour given off are mixed with products of imperfect combustion, and therefore need conducting to a flue. Professor Lewes has said:

Wherever you have an atmospheric gas-flame employed to heat substances like asbestos in a gas-stove, a considerable percentage of inflammable products of incomplete combustion escape unburnt. . . . It is, I think, now thoroughly recognized that it is impossible to do away with products of incomplete combustion as long as the heating flame is brought into contact with any surface cooler than itself. . . . The only way to get complete combustion is to allow the [atmospheric] flame to burn itself out without contact with any other body. [J.G.L., Vol. 66, p. 21.]

In experiments made in 1890 [J.G.L., Vol. 56, p. 1336], the same authority

Determined the composition of the products of combustion and unburnt gases escaping when a vessel containing water at ordinary temperatures is heated up to boiling-point by a gas-flame; the vessel being placed in the first case half-an-inch above the inner cone of the flame, and in the second case at the extreme outer tip of the flame.

	Inner.		Outer.
Nitrogen	75·75	..	79·17
Water vapour	13·47	..	14·29
Carbon dioxide	2·99	..	5·13
Carbon monoxide	3·69	..	—
Marsh gas	0 51	..	0·31
Acetylene	0·04	..	—
Hydrogen	3·55	..	0·47

These figures show most conclusively the evil effects upon combustion of placing comparatively cold substances in the bunsen flame; and I think it must be allowed that, where it is possible for over $3\frac{1}{2}$ per cent. of carbon monoxide to escape with the products of combustion, a flue connection with a reliable draught is an absolute necessity.

In a report upon the "Combustion Products of Gas-Stoves," Dr. T. E. Thorpe found, in his tests of three stoves, that carbon monoxide was present in the products of combustion from each stove, but in such small quantities that the Chief Inspector of Factories (to whom the report was addressed) remarks that the figures show that

While all flueless stoves give off impurities, the most dangerous product—carbon monoxide—is usually present in such small proportion that, with proper ventilation, it could not reach the percentage which has been found to cause mischief. [J.G.L., Vol. 84, p. 476.]

No acetylene was found in the products from any of the stoves. In the report by the Coal Smoke Abatement Society, upon the Thermal Efficiency and Hygienic Considerations of Gas-Stoves, published in the "Lancet" last November [J. G. L., Vol. 96, p. 539], the following conclusions are drawn:—

No carbon monoxide was detected in the hot air and gases coming from these stoves, except in one case; and in this case the makers said that the stove was faulty, and had been sent to the tests by mistake, instead of to their own testing-room. . . . The most likely gas of a poisonous nature which may be present is carbon monoxide; and this is not found under normal conditions in the products of combustion of coal gas. But it may be an intermediate product, as was shown by the "Lancet" Special Sanitary Analytical Commission on Smoke Prevention and Perfect Combustion of 1893. The flue gases were analyzed in several cases during the present tests; but in no instance was carbon monoxide detected in the flue.

Respecting the tests for impurities other than carbon monoxide and carbon dioxide—such as sulphur, unburnt hydrocarbons, acetylene, &c.—they said that they found that the results obtained were so small in all cases as to make the test somewhat unsatisfactory. They tried the same test upon the air in the corridor of the building, and on some scaffolding in the open air, and found that in both cases the amount of these impurities was greatly in excess of that in any of the rooms.

Before concluding, I wish to add a word regarding the gas-cooker. I was without a cooker for some time, because my kitchen was of such a shape that no convenient position could be found for one contiguous to the fireplace or chimney, or even to an outside wall. On reflecting upon the situation, it struck me as being very strange that the makers of cookers considered it necessary to have, and provided for, a flue connection from the oven (where the gas is burnt freely with a plentiful supply of air, and the flames do not impinge upon any cold substance, and are therefore under conditions in which we may conclude that combustion is perfect), while the products of combustion from the boiling and grilling burners on the hotplate (where the bunsen flames are used to play upon iron fretwork and cold cooking utensils, under which conditions Professor Lewes has proved that perfect combustion is impossible) are allowed to escape into the kitchen direct; for it is only in very exceptional cases that a hood is used to remove them. I concluded that if a flue were not necessary for the boiling-burners, the oven itself need not have a flue connection; and I therefore had a cooker fixed without any connection with the chimney. The result has been that my theory proved to be correct; for it is almost impossible for anyone entering the kitchen at any time to know by the smell whether the oven is in use. But the smell from the top boiling-burners is very bad when the ventilation of the kitchen is stopped. I consider it to be far more essential to remove from the kitchen the products of combustion from a flame used on a hotplate to heat (say) water in a saucepan, than it is to use a flue to the oven itself, where the only vapours to be removed are the products of the practically complete combustion of the gas and the vapours evolved from the food which is being cooked. If the kitchen chimney has a good draught, a flap ventilator fixed in it will be quite sufficient to remove all obnoxious fumes, or, failing this means, a window open at the top will probably effect the same purpose. I do not wish it to be understood that I recommend the fixing of cookers without flue-connections; for if it be at all possible such a connection ought to be made. But in cases similar to the one I have just quoted, it is possible, when the ventilation of the kitchen is perfect, to use a cooker without any ill-effects being felt or even noticed.

Discussion.

Mr. M'Nab, in advocating a general adoption of flues, remarked on the greater tendency of the burners of an oven to get out of order than those of the rings—partly because of the difficulty and inconvenience of getting at them for cleaning purposes, and partly because of their liability to get first stuffed up and then rusted up, after washing the inside of the oven. This might easily result in imperfect combustion, and in some burners failing to light, and so allowing small quantities of unburned gas to escape.

Mr. Booth, following on the same side, referred to the ease with which lights might be blown out or might "shoot back," on violently shutting the oven door, when the jets were turned low.

Mr. Walmsley dwelt upon the blocking up of the gas-nozzle, especially as the indrawn air came along the floor, and was likely to be charged with dust; and he condemned the placing of the air-inlet inside the oven.

Mr. Figg described some modern improvements that facilitated the removal of parts for cleaning, and so lessened the chances of imperfect combustion.

Mr. Cranfield, who proclaimed himself an uncompromising advocate of flue-connections for gas-stoves, emphasized the inadequacy of relying on people's sense of smell telling them when an atmospheric burner had "shot-back." Combustion under these circumstances was imperfect; and among other gases, highly poisonous members of the acetylene series were produced. The escape of small quantities of these gases rapidly produced headache, &c.; and though they had a penetrating and strongly disagreeable smell, he had been greatly struck with the widespread inability or imperfect ability to detect the smell. While many persons could almost immediately detect it, even from distant parts of a house, some failed to notice it when coming direct from the fresh open air, and very many others who would recognize it in this last instance were insensible to it when they had been present from the outset—especially if the gradually intensifying smell was accompanied by the usual odours of roasting. He thought Mr. Sutcliffe was dreaming of an unreached ideal, rather than dealing with existing conditions, when he said that "in the majority of cases the ventilation, either provided or accidental, was sufficient to remove the small quantity of injurious products given off." He regarded the habitual inadequacy of ventilation as one of the banes of life; and cases he had had to investigate professionally had convinced him of the seriousness of the evil, which was manifestly widespread. Perhaps flueless stoves and ovens might indirectly do good by so intensifying the evil as to force attention to it. Carbonic acid was present in the open air to the extent of 0·033 per cent. When, as the result of respiration, this had been increased to 0·06 per cent., there was reached what should be its limit in well-ventilated rooms; while with 0·08 per cent., there was the unpleasant smell familiar on entering crowded buildings. He admitted that here the chief unpleasantness and danger was due to the deadly organic exhalations from the lungs. The amount of these was difficult accurately to estimate; but as it increased proportionately with the carbonic acid of respiration, the amount of the latter was commonly accepted as a criterion of the contamination of the air. He had measured up his own dining-room, and found that to maintain a due purity in it the entire air needed renewing twice each hour for each person in it—no gas being lit. When gas was burnt, the problem of ventilation was much accentuated in difficulty, as each cubic foot of gas took up the oxygen of 8 cubic feet of air; and a burner consuming 5 feet per hour produced as much carbonic acid as five men. As illustrating these points, he ventured to quote from some results he had obtained in investigating the ventilation and lighting of a finely built modern church, which, being very lofty

and roomy, and having but a small congregation, would seem at first sight to be under very favourable conditions. While surreptitious draughts had been carefully prevented, ventilation was almost non-existent except through opened clerestory windows; while the lighting was by flat-flame burners on standards reaching about 2 feet above the level of one's head. During the morning service, the percentage of carbonic acid got up to 0·15; and at night, in spite of some open windows above, it reached 0·35 to 0·39, though during the sermon all lights were turned low. These figures might convey little to anyone unacquainted with the subject; but they were absolutely horrifying to those who realized their meaning. If such results were reached in 1½ hours in a very roomy church, they could imagine what might happen in small sculleries with a flueless stove used for several hours in doing a large baking of bread. He had carefully measured up the scullery in which his own cooker stood, making a deduction for all room occupied by closed cupboards, &c., and he had ascertained the gas consumption. The room was 10 feet high, and not specially small for a scullery; and yet, if the oven flue were removed, the oven jets and top rings all lit, and the windows closed, one-tenth of a minute was sufficient to bring the percentage of carbonic acid up to 0·1 per cent. (which he regarded as the maximum desirable). That was, the entire air would need changing 600 times in an hour. This might not be difficult in such a case as he had recently met with in a friend's house. A flueless oven stood exactly in the middle of the floor of a large kitchen, 8 ft. 6 in. in height; and the mistress of the house explained that they were perfectly satisfied with the arrangement, because in baking she invariably had both the door leading into the garden and the one into the house wide open, and a window also fully opened directly opposite the garden door. Less drastic methods had to suffice in most houses. Important as was the question of the amount of carbonic acid, he was, however, compelled to lay still greater stress on another point, which had not been referred to in the paper—viz., the sulphur dioxide produced by the combustion of the sulphur compounds in the gas. It might, perhaps, seem ungracious and inopportune to refer to this matter just now, when Parliament was so properly relieving gas undertakings from unnecessary and irksome restrictions; but he alluded to it simply as indicating the direction in which the gas industry might avoid a prejudice arising against certain uses of gas, and might guide architects so that in new and large houses gas appliances might not have to be introduced as an afterthought, but be deliberately planned for. Dangerous as carbonic oxide (carbon monoxide) was, 0·05 per cent. in the air was innocuous—at least, for some time—yet 0·001 per cent. of sulphur dioxide was noticeable, and 0·003 per cent. was decidedly and painfully so. Persons differed widely in their susceptibility to its influence; but those with any tendency to asthma and other throat troubles—particularly nervous affections of the throat—were very quickly and powerfully influenced by it. In many cases a few minutes by some gas ovens and rings meant no inconsiderable period of subsequent discomfort. The Gas Referees' allowable maximum of sulphur was 17 grains per 100 cubic feet in summer, and 22 grains in winter. It would be quite safe to assume that this would be exceeded in all cases where no special removal of the sulphur compounds other than sulphuretted hydrogen was carried out, and more especially in those instances where no lime at all was used in purification. He thought he might assume an average of from 30 to 60 grains up and down the country. He had then calculated that his own cooker, with the flue removed and with the windows shut, would, with the oven jets and top rings all burning, reach the perceptible 0·001 per cent. of sulphur dioxide in 2½ minutes if the gas contained 60 grains, and in 5 minutes with 30 grains; while the top rings alone would achieve the same result in 3¾ and 7½ minutes with 60 and 30 grains respectively. These times closely approximated with his own personal experiences. He fully agreed with Mr. Sutcliffe that the top rings of a cooker were often responsible for more mischief and discomfort than the jets of the oven, partly because more often used turned up to the full. Instead, however, of condoning the absence of an oven flue, he looked forward to a more general use of an additional convenient hood arrangement to draw off the products of combustion of the boiling-rings, &c. This was unfortunately too often impossible now; but in large houses where an architect had a free hand, he really ought to make his plans so as to permit of some such contrivance—especially as the usual device of an open window might in some directions of the wind become only the fresh air inlet, and drive the heated waste gases down across the room and into the house. He lately conversed with a friend who had been induced to put a flueless heater out on the floor of a bed-room, and who was disposed lightly to wave aside as pure fancy his wife's assertion that she could not breathe with the stove alight. She was subject to bronchitis; and her symptoms and the time that elapsed before their development, plainly pointed to sulphur dioxide as being the main source of her dissatisfaction with the heater. The need of flues was, perhaps, most palpably manifest when a basement wash-kitchen had a gas-boiler which had been allowed to get corroded and made up (which perhaps more easily happened, and was more often allowed to continue, in this case than in any other). In these instances, an imperfect or non-existent flue might convince even hardened sceptics as to the need of assisting the products of combustion to escape. Most references that afternoon had been made to gas-ovens. He assumed, however, that even those who viewed with complacency the use of flueless ovens would hesitate to advocate the adoption of flueless gas-fires in ordinary rooms, though he admitted that such stoves were often very useful in some shops where flues were impracticable, and where the door was always ajar or frequently open. He did, however, remember the perfervid praise of such a flueless stove by a representative at a gas exhibition, who assured him that that type of stove had been tested in a Government office by being lit, and then all the windows and doors of the room having been closed. The stove was allowed to burn for three days and nights, at the end of which time the air of the room was as pure and good as at the beginning of the trial!

Mr. Demain spoke of the experience of his works in fixing large numbers of cookers without any flues, a course which he stoutly defended. No complaints ever reached the gas-works of smells or any inconvenience arising from the absence of flues; any complaints being the usual ones due to jets being out of order and the holes in the nipples being blocked. They certainly did prefer to put flues to the very largest sizes of ovens, but regarded the expense as too serious and needless in the vast majority of cases. Flues led to the open air gave trouble in windy weather, when the jets were sometimes blown out, and flues led to chimneys ran the risk of being blocked by falls of soot. He certainly disagreed with the last speaker's demands, and urged his own experience of the absence of complaints from consumers as being quite a valid counter-plea.

Mr. Cranfield absolutely declined to take the absence of formal complaints against a given course as being any justification for that course, or to accept a consensus of opinion as necessarily settling the rights of that opinion. He was aware of a very general practical embodiment of the belief that no ventilation was needed for bed-rooms during the night, and that even after rising such rooms needed no special sweetening; but this did not affect his estimate of the undesirability of such practices. Similarly large numbers might be found who saw no need for baths in a house; but did their belief settle the question?

Mr. Sutcliffe briefly replied to the discussion, and repeated that he stood by what he had said in his paper on one or two points which had been challenged.

Mr. W. Lawson-Mitcheson then read some

NOTES ON THE REPAIR OF A GASHOLDER.

[In connection with this paper, see the photographs and drawings in the "Journal" for May 29, 1906, pp. 580-82.]

This paper consists of a series of notes on the repair of Gasholders Nos. 3 and 4 at the Huddersfield Corporation Gas-Works, and does not aspire to be a treatise on general gasholder repairing. At the outset, I must apologize for bringing before you a subject which has been partly dealt with before; but I hope the additions I have made to the information then given will prove interesting and perhaps useful to you.

There are five gasholders at Huddersfield; their total capacity being about 3½ million cubic feet. For some time past, Holders Nos. 3 and 4, which are three-lift telescopic, with square cups and grips, had been giving trouble owing to the cups leaking water—thus making it unsafe to leave the holders fully inflated for any length of time. At first this trouble was overcome by connecting water up to the cups by means of a flexible hose and ½-inch service-pipe; but in the spring of 1905 the leaks became so pronounced as to necessitate further measures being taken.

In each case endeavours were made to find out something further about the faulty places as follows: The holder was inflated until the leaking cup was some 2 or 3 feet above the tank edge, and syphons of 1¼-inch lead pipe were then set to work to empty the water out of the cup. As soon as the water-level had sunk so far that the gas pressure could overcome the head of water, bubbles made their appearance in several cases round the cup. The syphons were stopped, and the faulty places examined so far as circumstances would permit. It was found that in several places the riveting between the shell plating and the channel-iron had given way; and also that in one of the sheets there was a crack about 14 inches long and ⅓ inch wide. In my opinion, the failure of the riveting was due to the fastening together of a thin plate (3-16 inch) and a stiff channel-iron with a virtual depth of 7 inches; the sudden change in thickness causing a fretting action which was soon accelerated by corrosion.

It was seen that no satisfactory repairs could be undertaken from the outside; and so an order was given to Messrs. Clayton, Son, and Co., Limited, of Leeds, to thoroughly examine Holder No. 3 and report. The holder was emptied, and the manhole covers loosened so that a vacuum would not form and pull the crown in, and the inlet and outlet pipes blank-flanged. A 6-inch connection from a branch in the inlet-pipe was made to an exhauster driven by a portable steam-engine. By means of this, the holder was inflated several times with air. Windows and an air-lock were fitted to the crown; and Messrs. Clayton's representatives then went inside the holder on a raft, and made a thorough examination as it was inflated. Their report confirmed our observations, with the addition that several of the dip-plates and holder-sheets were found to be in very bad condition. It was then decided to effect a thorough repair of the holder.

We now come to the repair of Holder No. 4, undertaken the following summer, and similar to that of No. 3. No. 4 is a three-lift telescopic holder of about a million cubic feet capacity. The cups are 18 inches deep, and are formed of a 7-inch by 3-inch

channel-iron and 3-16-inch plates, stiffened along the edge with a 2-inch by ½-inch half-round iron. As it was not desirable at Huddersfield to empty a holder-tank, owing to the difficulty of disposing of the water, it was necessary, in order to effect any repairs, to lift the two outer shells clear out of the tank.

The bottom curb consists of two rings of 3½ inch by 3½ inch by ½-inch angle-iron. The holder was fully inflated, and the upper one of these drilled to receive 16 equidistant 1-inch diameter U-bolts, which were inserted and securely fastened. To each of these, a pair of 10-inch by 3-inch by ½-inch plates were attached by means of 1-inch diameter bolts; and to these lifting-bars 3 inches by ½ inch by 6 ft. 6 in. long were affixed, one by one, as the holder was gradually lowered. These rods were tied up to the guide-framing by ropes until required. Lifting trestles were then placed round the holder; these supporting screws (2½ inch diameter, 1 inch pitch, and 7 feet long), to which were fixed the top ends of the lifting-bars. The holder was grounded, the manhole covers loosened, and the inlet and outlet pipes blanked-up. The roller carriages and hand-railing were then removed from the two inner lifts.

The screws were all carefully adjusted by hand to give an equal tension, and one side of each nut chalked. Two men were then stationed at each screw; and at a given signal, each nut was turned through a complete revolution—the signal being repeated from time to time until the outer shell had been raised through one screw length. A prop was then inserted under the grip of the outer shell, opposite one screw, to support the weight while it was uncoupled, one lifting-bar removed, and the next one connected up. When each bar had been thus shortened, the lifting was continued until the outer shell had been raised 2 ft. 6 in. clear above the tank edge.

Cantilevers were then placed under the bottom curb. Ear-plates of ½-inch steel were attached to the top grip; and to these were fixed chains, passing round the columns of the guide-framing. The chains were tightened up by means of right and left hand screw couplings. When the outer lift had been thus secured, the screws were uncoupled, and the top bars of the trestles lifted up and fastened across the first tier of the girders and the top grip of the outer shell. From these the screws were arranged for lifting the second shell. As it was impossible to fix ear-plates to the second shell on account of its position in the tank, it was necessary to lift it at first by means of hooks placed round the dip-plates. When the lifting had been carried far enough to allow of it, ear-plates were attached, and the lifting proceeded from these. The lifting went on until the shell was about 1 foot clear of the water. Then short pieces of 9-inch by 3-inch timbers were put under it, spanning the space between the inner lift and the tank edge. For safety, the shell was lowered on to these.

The sheeting was carefully examined, and it was found necessary to renew the bottom ring of plates, several of the cup-plates, and one length of the channel-iron. The plates to be removed were numbered consecutively, and cut out, leaving at first, however, every third plate, in order to retain the relative positions of the parts. The old plates were dispatched to Messrs. Clayton's works, and new ones made to the same sizes. When these arrived, they were riveted into position, and the rest of the old plates cut out and renewed in the same way. When complete, the new cup was tested for water-tightness, and found satisfactory. It was then painted.

As the grip of the outer shell had to support the weight of the inner one during lowering, no plates were cut out of it until the latter had been lowered into the tank. As it was lowered, the sides were examined; all faulty places being repaired. The holes where the ear-plates had been fastened on were filled with set-screws, and the heads riveted over. The work of renewing the plates in the outer shell was next proceeded with; and when finished, the lifting-trestles were rigged up again, and the shell lowered into place. One man to each screw was found sufficient for the lowering.

When both lifts were down, the roller-carriages were replaced and adjusted. Windows and an air-lock were fitted to the crown, and the holder re-inflated with air. The U-bolts and lifting-bars were removed from the bottom curb, and then men were sent inside on a raft to make a final examination and to adjust the inner guide-rollers.

Some care is needed when working inside a gasholder, as the tank-water contains about 7 per cent. by volume of dissolved gases. The tank in question was filled with more than 2,000,000 gallons of water, which had dissolved in it about 24,000 cubic feet of gas. A sudden fall in the barometer, or a sudden rise in temperature causes a good deal of this gas to be given off into the air. Gases are also freely given off when the water is agitated by a holder cupping. On this account, it was thought best to station a man in the air-lock to keep an eye on those inside, and get them out if they showed any signs of fatigue.

When the holder was once more grounded, the windows and air-lock were removed and the crown made good. The holder was then filled with gas, and received its due coat of paint. The total time occupied in the repair of Holder No. 4 was twelve weeks; and the only accident that occurred was that one of Messrs. Clayton's apprentices fell into the tank, and was fished out soaking wet. The cost of the repairs was: Holder No. 3, £811; and Holder No. 4, £652.

The paper was illustrated by a series of lantern slides. The subject naturally did not invite formal discussion; but a number of questions were asked and answered. Mr. Lang and others referred to the precautions taken to ensure even lifting by uniform turning of the screws, and pointed out how a sharp and experienced workman, finding himself next to a "green" one, could contrive, by getting half-a-turn ahead or behind, to throw most of his share of the lifting on to his companion. It was pointed out that, by putting the old hands alternately with new ones, even if this device was adopted, the holder would still rise or fall evenly, though the burden of the work would be unevenly distributed. Mr. Demain quoted an experience at his works where a Gadd and Mason holder was being built up, and one man giving two or three extra turns to his screw threw the weight so unevenly that the cup and the sheets that had been attached all broke loose and fell into the tank. This involved the contractors in considerable expense.

The readers of the papers were heartily thanked.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The members of this Association met in the Municipal School of Technology, Manchester, on Saturday afternoon—Mr. R. H. GINMAN in the chair.

The PRESIDENT, in opening the meeting, welcomed several new members of the Association.

Mr. L. D. MOSLEY, the Assistant-Engineer of the Stretford Gas Gas Company, read the following paper:—

SOME RESULTS OF LOW-PRESSURE INCANDESCENT STREET LIGHTING.

In January, 1904, the Stretford Gas Company placed a scheme before one of the Urban District Councils in their area for an improved lighting of the district controlled by the Council; the scheme embodying the substitution of the incandescent system for that of the flat-flame burners then existing. The Company had for some months maintained, at their own expense, a few incandescent lamps in this particular district, in order to show their superiority over the flat-flame system. The scheme was adopted; and I propose to give an account of how the work was carried out, and of the lighting results of the past two seasons.

Under the agreement, the Company had to supply and erect the necessary lanterns, burners, &c., and maintain them for a fixed charge per lamp for a period of five years (the price to cover the repairs of lanterns, burners, renewals of mantles, protectors, &c.), to paint the pillars with one coat of paint per year, and to pay all expenses of lighting, cleaning, &c. The number of hours for which the lamps should be lighted was to be 1750 or thereabouts; giving a lighting period of 40 weeks per annum. The price to be paid by the Council to the Company for dismantling the old system and the providing and erecting of the new lanterns, was £420; this amount being paid to the Company in five equal annual instalments of £84 each, *plus* interest. The number of lamps in the area was 187; and 186 of them had to be fitted with low-pressure burners—the remaining one with some form of self-intensifying burner. The distance of the lamps apart was from 60 to 80 yards. The area is a suburban one; and the roads are narrow and winding.

As the Council desired that the existing pillars, which are very light in section, should be used, it was necessary that they should be made as rigid as possible. This was done by encasing the foot of each pillar with concrete. The service-pipe to each lamp was carefully examined and renewed where necessary; and in all cases it was well packed, to prevent sagging. The upright services were renewed, and the end was made secure by passing it through a piece of ¾-inch hydraulic tube secured to a cast-iron bobbin; the hydraulic tube being held securely in position by means of two set-screws fixed through the sides of the column. The concreting of the base and the packing of the uprights were done to ensure as much rigidity as possible. I consider that too much attention cannot be paid to these items.

The lantern was fixed to a frog, which in turn was attached by set-screws to the bobbin already mentioned; thus giving the whole as much stability as was possible. The type of lantern adopted was that known as the 14-inch "Windsor." It is made of copper, and fitted with enamelled steel convex reflectors and chimney; also with steel rods to the body ribs, ball-trap door, and wrought-iron frog. The burner adopted was the No. 3 Sugg, fixed on an anti-vibrating frame; the burner being lighted by the Simmance-Abady flash-torch. Each burner is fitted with a Sugg governor, regulated to pass 3½ cubic feet of gas per hour (except the high-pressure burner), tested at a pressure of 25-10ths. The usual system of supplying gas to the public-lamps is on the average meter system; there being one meter to every ten lamps in the Council's district.

The number of lamplighters employed is three; and their duty is to light and extinguish the lights and keep the lanterns in a proper condition, so as to satisfy the requirements of the Company's Engineer and the Council's Surveyor. Each lamplighter is supplied with lighting cards, upon which he books the time of lighting and extinguishing and any necessary repairs. These cards are handed in each morning, so that any repairs or renewals may receive prompt attention. The renewals, &c., are entered in a record-book.

The following statistical and other particulars in regard to the scheme will be of interest:—

First Year's Returns.

556 mantles, No. 3 . .				By amount received—		
21 ,, (h.p.) . .	£8	6	4	Half year ending		
61 protectors . . .				Dec., 1904 . . .	£191	15 3
19 rods				Half year ending		
Lighting, wages, and superintendence . .	160	19	7	June, 1905 . . .	163	15 1
Gas	139	2	8			
Materials and repairs .	19	16	9			
Clothing, torches, plates	14	0	5			
Balance	13	4	7			
	£355	10	4		£355	10 4

NOTES.

December half year—
186 lamps burning 950 hours, at 37s. 3d.
1 lamp ,, ,, ,, ,, 99s. 6d.
1 ,, ,, 693¼ ,, ,, 37s. 3d.
} Per lamp for 1750 hours.

June half year—
190 lamps burning 808¾ hours, at 36s. 9d.
1 lamp ,, ,, ,, ,, 98s. 0d.
1 ,, ,, 368¼ ,, ,, 36s. 9d.
} Per lamp for 1750 hours.

Gas consumed in low-pressure lamps . . 1,139,318 cubic feet.
Do. per lamp . . . . . 3·44 c. ft. per hour.

Second Year's Returns.

723 mantles No. 3 . .				By amount received—		
33 ,, (h.p.) . .	£11	0	8	Half year ending		
79 protectors . . .				Dec., 1905 . . .	£194	3 6
43 rods				Half year ending		
Lighting, wages, and superintendence. .	167	13	8	June, 1906 . . .	174	1 6
Gas	138	11	2			
Materials and repairs .	14	19	0			
Clothing	5	7	9			
Balance	30	12	9			
	£368	5	0		£368	5 0

NOTES.

December half year—
191 lamps burning 934½ hours, at 36s. 9d.
1 lamp ,, 934½ ,, ,, 98s. 0d.
7 lamps ,, 3938½ ,, ,, 36s. 9d.
} Per lamp for 1750 hours.

June half year—
198 lamps burning 824 hours, at 36s. 9d.
1 lamp ,, 824 ,, ,, 98s. 0d.
1 ,, ,, 552¾ ,, ,, 36s. 9d.
} Per lamp for 1750 hours.

Gas consumed in low-pressure lamps . . 1,157,391 cubic feet.
Do. per lamp . . . . . 3·34 c. ft. per hour.

Mantle Account per Lamp per Annum.

	Year Ending June 30, 1905.		Year Ending June 30, 1906.
Mantles	3·80	..	4·70
Protectors	0·42	..	0·52
Rods	0·13	..	0·28

The materials employed in conjunction with the lighting are the best of their respective kinds. The mantles now used, particulars of which have been given as regards consumption, were subjected to severe trials before being adopted for the lighting of the district.

The methods adopted for the supervision, lighting, and maintenance, are as follows: The lanterns are cleaned once a week, and, in any case, they must be clean for the week-end. Each lamplighter is provided with a brush for cleaning the burners, nipples, &c., so that the burners may always be at their highest efficiency; but the Company have no agreement to give a stated candle power, as, I believe, is the case in some places. No mantles are allowed to become defective (in fact, it does not pay, with mantles at present prices, and every broken mantle exposed to the public view is not a good advertisement for the use of gas as an illuminant); instructions being given to the lamplighters that if any badly damaged mantles are found when they are on the lighting round they are to be replaced by new ones the same night. These rules are strictly adhered to, for it is only by keen inspection and careful attention that efficient lighting can be obtained. The lamps are inspected at least once per week (no special day being set apart), Sunday included, by the chief fitter in the Maintenance Department; and as the lamplighters are under the care of the Mains Department, the official in charge sees that the lanterns are clean and that the burner is kept up to the required standard of efficiency. At the end of the lighting season, the burners are taken out of the lanterns and thoroughly cleaned, and any defective parts renewed; the governors are tested or renewed, as the case may be; and everything is got in order for the next season.

As previously stated, I attribute the successful results obtained to be due to the columns, service-pipes, and lanterns being properly fixed, and particularly to the base of the columns being made as rigid as possible. I have abstracted the mantle account for 26 lamps in this lighting area situated in a portion of the main road from Manchester to Chester, on which there is a very large amount of traffic. A census taken for the seven days (of 24 hours each) ending Oct. 17, 1904, shows that 16,668 vehicles passed a given point on the road; the number being made up as follows: 2862 lorries and carts, 4038 traps and other vehicles, 561 motors, and 9207 cycles, motor cycles, &c.—an average of 2381 per diem. This number has since largely increased. The Corporation of Manchester now run a car service through the district; and, in addition, there is also a heavy increase in motor traffic, both of the heavy and the light type. The number of mantles used on the 26 lamps during the past season has been 67; equalling 87 in twelve months. This gives an average of 3·3 mantles per lamp per annum, which, considering the traffic, will be hard to beat. As a contrast to this, and to show the point I wish to put before you, eleven lanterns were fixed in another area, on columns of which the bases had not been made rigid. The type of lantern used was the Welsbach open-flap, fitted with governor burner and anti-vibrating frame. The mantle account for these lamps averaged 11·6 per lamp per annum.

There are six bracket lamps in the area. They stand out from the wall a distance of from 1 ft. 6 in. to 2 ft. 6 in. The mantle account for these lamps averages 4 per lamp per annum. Mr. S. Meunier, of Stockport, in a paper on the subject of "Incandescent Lighting and Maintenance," read before the Manchester District Institution of Gas Engineers on Nov. 28, 1903, suggested that bracket lamps should be more employed. He gave two tables showing the mantle accounts for the twelve best and the twelve worst lamps in his district.* Of the best lamps, two were bracket lamps with a consumption of 4 mantles per lamp per annum; six were lamps fixed away from the kerb on dwarf walls, &c., and had a consumption of 3·5 mantles; and the remaining four were pillar lamps, with a consumption of 4 mantles. The worst lamps were all pillar lamps, with a consumption of 15·5 mantles each per annum. The tables showed that, unless special precautions are taken, the pillar lamps are more expensive in renewals.

As to the use of inverted burners for street lighting, several have been tried in this area; the burner being fixed well up in the lantern, and fitted with an opaline globe. The light given is well diffused and very effective; but the mantle account is in excess of that for the vertical type, it being at the rate of 5·3 mantles per lamp per annum. I attribute this excess to the fact that this type of burner requires more attention in lighting.

Discussion.

Mr. R. H. GARLICK (Salford), commenting upon the "returns" furnished by the author of the paper, expressed the opinion that the results attained, on the whole, were excellent. The number of mantles per lamp for the year ending June 30, 1905 (3·80) was very satisfactory. It was evident that the supporting columns should be made as rigid as possible. This was a point which had been brought forward in the Swinton district. They had 103 lamps going all the year round; but the heavy traffic on some of the roads was very noticeable, and the vibration was consequently considerable. He thought the time had not yet arrived for the production of a really effective lamp for lighting. What was wanted was a perfect lamp; and here there was an opening for the inventor. He had been struck with the record of the bracket lamps, and he believed that sufficient attention had not been given to the vertical burners. He should be able to take to heart the information Mr. Mosley had given; and he trusted it would be an incentive to others to come forward and read papers on the same subject.

Mr. A. L. HOLTON (the Secretary of the Association) considered the second year's returns showed a rather serious increase in cost; and he said he should like to hear Mr. Mosley's opinion upon them.

Mr. D. V. HOLLINGWORTH (Salford) complimented Mr. Mosley on the transparent honesty of his paper. In future work of the kind, the members of the Association would have the benefit of his experience. He (Mr. Hollingworth) was, however, struck with the number of mantles used per annum, which he considered to be abnormal. He should like to be favoured with the total cost before the conversion. The cost of the incandescent lighting for the first year was £355 10s. 4d.; while in the second year it had risen to £368 5s. The repayment to the Company, he observed, was to be spread over five years.

Mr. SHAW (Darwen) noticed by the paper that the number of lamplighters was three, and they had to keep the lamps in proper condition. The number of mantles used at high pressure struck him as being rather large.

Mr. C. E. TEASDALE (Salford) remarked that the distance of the lamps from each other had been given as from 60 to 80 yards. This seemed a great distance on a main road. Was it measured by the kerb, by the centre of the road, or diagonally? At such a distance from each other, he should not consider the lighting could be efficient.

The PRESIDENT said the burners employed were of an excellent type; but there were others, one of which could be used without a governor. There were some governors which had no means of regulation. As to the automatic lighting and extinguishing of public lamps, in his opinion the cost of the appliances almost put them out of court.

Mr. MOSLEY, replying to the various observations, contrasted the cost of mantles at Stretford with Wakefield and other places, and said he thought, considering the efficiency kept up, that the Stretford returns bore very favourable comparison. He went through the streets night after night, and out of 104 lamps found only one bad mantle. They had good lamplighters, and this was everything. As to the extra cost on the second year, it was accounted for by a long stretch of the main road being concreted

* See "JOURNAL," Vol. LXXXIV., p. 542.

or tramlines. A considerable number of lamps had to be taken down, and this caused damage. The cost per annum of the old system before conversion was £434 for 1750 hours' burning. They had now better lighting at much less expense. The reason for extending the payments to the Company over five years was to lessen the rates. In one district that he mentioned, the repayment for conversion had extended over ten years. The cost of high-pressure lamps would be reduced if more perfect rigidity could be obtained. It had been found that some breakages occurred through the flames impinging upon the mantles. With regard to the distance of the lamps from each other, the actual space was 35 yards, as there were lamps both sides of the road.

The PRESIDENT observed that in his district, after a recent storm, 150 out of 300 lamps had no light—(laughter)—but they had not yet secured rigidity in their system, their lights hanging loose in a cradle at the top.

Mr. MOSLEY then gave some practical illustrations of automatic gas-burners.

On the motion of Mr. OLDFIELD (Denton), seconded by Mr. BRADDOCK (Radcliffe), a vote of thanks was accorded to the reader of the paper. Mr. Braddock mentioned that in his district they had nothing to do but supply the gas. After a recent gale, he found not one decent mantle in every dozen.

The resolution was carried with applause.

Mr. MOSLEY having briefly acknowledged the compliment, the meeting terminated.

Gas-Driven Warships and Liners.

The subject of the use of gas for marine propulsion, even in the case of large warships, came forward rather prominently toward the close of last week. News reached England from New York on Friday that Mr. Lewis Nixon, the well-known marine architect, who has designed several ships for the American Navy, has obtained patents for an engine which he believes will reduce the voyage across the Atlantic to four days. It is of standard type, and the motive power is supplied by gas obtained from crude petroleum. He explains that the first vessel designed by him to cross the Atlantic in four days by means of his improved gas-engines will be a torpedo-boat destroyer of 650 tons and of 12,000 H.P. It will be able to maintain a continuous speed of 30 knots, with a maximum speed of 33 knots per hour; and her machinery will weigh only 210 tons. At the meeting of the Royal Institute of Naval Architects on the same day, Professor Lewes read a paper on "Some Phases of the Fuel Question," in the course of which he stated that we seem to be on the eve of a period of rivalry between the marine engine and turbine on the one hand, and the oil and gas engine on the other. He said there was no gainsaying the unqualified success of the petrol motor-boat, while the labours of Capitaine and others had now made suction plant and the gas-engine a possibility; and it was stated that the oil-engine, using heavier grades of oil than petrol, would soon be employed for marine propulsion. Interviewed by a representative of "The Tribune" on the subject of Mr. Nixon's new gas-engine, Professor Lewes stated that, from his familiarity with the experiments that had for some time been taking place, he had no doubt that the propellant used would not be crude petroleum, but petroleum from which the petrol had been extracted—leaving an oil with a flash-point of not less than 150° Fahr. as the fuel used. He added that he was personally well acquainted with Mr. Nixon, and he only hoped that the report of his successful solution of the problem was correct, as if by this means, with oils of a safe flash-point, 12,000 H.P. could be obtained, there was no reason why the power necessary for the largest Atlantic liners and war vessels should not be within reach, and an entirely new era thus created.

New Earth-Boring Tools.—In carrying out excavation or well-sinking work, trial holes are generally necessary, in order to ascertain the nature of the ground. An attempt has been made by Herr H. Meyer, of Hanover, to supersede the appliances generally used by the introduction of a set of three implements which he calls "earth augers." With the first, which is named the "Triumph," the inventor claims that two workmen can in three hours bore in loamy and clayey soil a hole 4 inches in diameter and 30 feet deep. The second—the two-edged cylinder auger—is specially adapted for boring in rich soils, sand, gravel, &c., and is chiefly employed where the holes have an unusually large diameter, up to 24 inches. The third, on account of the varied uses to which it may be put, is called the "Universal" auger. It is constructed cylindrically, and provided with a slot capable of being closed on the side, and a valve-box, which can be screwed on and off. This innovation admits of boring in dry soil, in clay, loam, gravel, sand, brown coal, &c., without closing either the slot or the valve. In boggy land, however, the slot can be closed by a slider, and the valve screwed on. In the latter condition the cylinder becomes full by simple rotation. When lifting the apparatus, the valve closes of itself, and the contents of the cylinder are brought up safely to the surface. Owing to the particular position of the two edges, the auger does not become fixed in the ground, but cuts itself free, and therefore can be raised easily. The borer can, according to its size, raise stones 8 inches in diameter.

VALUATION OF GAS OILS.

A recent issue of the "Journal für Gasbeleuchtung" contains an article by Dr. A. Spiegel, in which the author discusses the methods hitherto available for estimating the value of oils employed either in the manufacture of oil gas or the preparation of carburetted water gas, and finally describes a plan which he believes will prove of some assistance to gas engineers in ascertaining more particularly the value of such oils as carburetting agents.

In the first place, the author mentions that none of the common tests for ascertaining the value of gas oil given by Lunge and other writers affords any direct information as to the practical or carburetting value of the material. For example, it is not the calorific value of an oil which makes it useful in the preparation of carburetted water gas, but rather the amount of heat which the cracked oil adds to the water gas. Naphthalene is practically devoid of carburetting value, although it possesses a calorific power only a little lower than that of paraffin oil—equal, indeed, to those of stearic and oleic acids, both of which are very valuable substances. Again, the calorific value of an oil is greatly reduced by the amount of oxygen it contains; but the latter constituent does not diminish its carburetting value. The normal mineral oils available at the present time also contain oxygen in the form of fatty esters and alcohols, which are valuable when the oil is gasified. Their existence, however, in an oil required for carburetting purposes leads to errors when the material is examined by ordinary methods, as they increase the specific gravity and decrease the calorific power, although they are as useless as creosote in the manufacture of carburetted water gas.

In view of these circumstances, many gas engineers refrain from examining an oil according to the usual methods, preferring to estimate its value from the results obtained on heating it in a retort so as to obtain an oil gas. Now, the gas oils of commerce have no intrinsic carburetting value, because none of them are sufficiently volatile to be taken up by cold gas. When exposed to heat they are partially converted into gaseous bodies and liquid substances of low boiling point, which remain suspended in the gas; and, according to the temperature employed, the amount of cracking of the oil varies until, if the heat is pushed to a sufficient point, the decomposition is so far-reaching that only free carbon and hydrogen are produced, and the amount of light-yielding material falls to zero. Hence a plan has been adopted —as, for instance, in the Peebles process—of running a gas oil into a retort having a large heating surface but maintained at so low a temperature that the gasification of the oil remains incomplete; the uncracked oil being then mixed with fresh oil and introduced again into the retort until the whole is decomposed. The ordinary oil-gas retort, on the other hand, possesses a comparatively small heating surface, and it therefore has to be raised to so high a temperature that the cracking of the oil goes too far. It is well known that the lower the retort temperature the smaller is the make of oil gas, but the higher is its candle power; whereas the mathematical product obtained on multiplying the make by the candle power attains a maximum at a certain mean temperature which varies with different oils gasified in retorts of the usual type. The amount of candle power that can be obtained per unit weight of oil cracked depends upon the method employed for the cracking of it; and quite roughly speaking it may be said to be (quoted in Hefners per 100 kilos) 19,000 in the ordinary process of oil-gas manufacture, 25,000 in the Peebles process, and 30,000 when the oil is used to make carburetted water gas.

The greater amount of candle power obtained from the oil when the latter is used to prepare carburetted water gas, is due to several causes. (1) In carburetted water gas the carbon of the oil gas which yields the light is developed within a flame of hydrogen coming from the water gas, whereas in an oil-gas flame the hydrogen comes from the oil gas itself, and waste occurs. (2) A larger volume of gas is made when the oil is used for carburetting purposes, and, therefore, the more volatile liquid hydrocarbons are not so liable to be deposited as when the oil is used to make oil gas. (3) The carburettor is a vessel of extensive heating surface, so that the oil is heated without being raised to an excessive temperature. (4) The hydrogen of the water gas may also act beneficially, either by altering the equilibrium so that less of the oil is decomposed into free graphite and hydrogen, or by retaining in the gas as methane substances which would otherwise pass into the tar—as Sabatier and Senderens have shown to be the case when benzene is heated with hydrogen. Doubtless these four reasons for the increased yield of candle power from oil when employed to make carburetted water gas differ in relative importance according to the nature of the oil and the extent of the carburation.

The process recently described by Ross and Leather, which consists in gasifying an oil in a model retort, is undoubtedly the most correct of such processes. Objections may be urged against it, that it does not show the full effect of the polymethylenes which Haber has shown to be probably present, or of the homologues of methane which Graefe has proved to be always present in the gas. But in the hands of Messrs. Ross and Leather it has given results agreeing so well with those obtained during the manufacture of carburetted water gas that it must be considered of very great utility. It is distinctly to be preferred before the

Kind of Oil.	Specific Gravity.	Iodine Value.	O + S + N. Per Cent.	C. Per Cent.	H. Per Cent.	"X." Per Cent.	10X.	Carburetting Value: 10X × 15 + 250 pf. Marks per 100 kilos.
Anthracene oil, crude	1·097/21°	63·4	3·49	89·76	6·75	..	..	..
,, free from creosote and bases	1·092/19°	28·3	2·21	91·15	6·64	..	..	..
Creosote oil ,, ,, ,,	1·036/21°	29·0	1·83	90·92	7·25	0 25	2	2·80
Benzol, theory	0·879/20°	0·0	0·00	92·30	7·70	..	..	..
Petroleum distillate, extra-European	0·955/18°	11·6	3·24	85·83	10·93	3·93	39	8·35
Paraffin oil, European, distilled (1)	0·909/21°	51·4	3·07	86·00	10·93	3·93	39	8·35
,, ,, ,, (2)	0·885/19°	77·9	2·84	85·37	11·79	4·79	48	9·70
,, ,, ,, (3)	0·867/19°	49·3	3·05	84·92	12·03	5·03	50	10·00
Petroleum distillate, European	0·886/15°	29·8	1·82	85·85	12·33	5·33	53	10·45
,, ,, extra-European	0·857/18°	22·8	1·15	85·81	13·04	6·04	60	11·50
"Paraffinum Liquidum"	0·878/21°	0·0	1·32	85·20	13·48	6·48	65	12·25
Lamp oil, Russian	0·819/19°	1·0	..	..	..	..	..	..
,, American	0·798/20°	16·8	0·06	85·74	14·20	7·20	72	13·30
Undecane, theory	0·741/20°	0·0	0·00	84·61	15·39	8·39	84	15·10

Wernecke-Helfers process, when an oil is to be examined as to its suitability for oil-gas preparation. The Wernecke apparatus has certainly proved valuable to the chemist in studying the process of oil gasification, enabling Eisenlohr to demonstrate that, in spite of earlier beliefs to the contrary, there is no objection to mixing oils of different boiling points, that oils rich in paraffins give a higher amount of candle power than such as are poor in paraffins, that the yield of gas is the smaller the less completely saturated are the hydrocarbons in the gas, and that there is very little to be said against using an oil of high boiling point. According to Lunge, it is important to estimate the proportion of hydrocarbons soluble in strong sulphuric acid, and to submit the gas oil to a distillation test, because a high proportion of unsaturated hydrocarbons and of matter boiling above 300° C., is prejudicial. Eisenlohr's results sufficiently proclaim the incorrectness of the last requirement; while the first is opposed by the observations of Engler and Jezioranski, who have shown that many petroleum residues are almost entirely soluble in strong sulphuric acid, although they differ considerably in carburetting value. Moreover, Graefe's notion, that the lower the iodine value of an oil the better it is for gas-making purposes, is rendered untrustworthy, because the aromatic hydrocarbons found in many oils do not combine with iodine, so that an oil containing them appears improved, instead of being injured through their presence.

What has been said above, coupled with the statements collected in Scheithauer's valuable book on mineral oils, tends to show that an oil is the more valuable the more nearly saturated its hydrocarbons are—that is to say, the more hydrogen it contains. On this basis, Dr. Spiegel has elaborated a method for estimating the practical value of a gas oil. It consists in determining the proportion of hydrogen in it by the ordinary process of ultimate analysis. The proportion of hydrogen in different oils varies largely, being smallest in the oils of coal tar and highest in the aliphatic paraffins—especially the undecane synthetically prepared by Ross and Leather to which those authors ascribe the highest carburetting value—whereas that of anthracene oil, for example, is practically zero. In the above table are collected analytical and other details of various oils which may be employed for gas manufacture.

Inasmuch as the hydrogen present in the coal-tar oil possesses no carburetting value, only that portion of the substance which remains in the form of tar is of any use. The lower the carburetting value of an oil the more tar it yields, and *vice versâ*. Even the best oil leaves some tar as a bye-product when employed for carburetting water gas, but leaves much less than a coal-tar oil. It may be said that a suitable coal-tar oil contains on an average 7 per cent. of hydrogen. When a gas oil very rich in hydrogen is employed, more than the excess of hydrogen over the above-mentioned 7 per cent. enters in a useful form into the gas, so that less than the 7 per cent. remains with the tar; and it may be argued that the extra amount of gas so produced from oil of the best quality over the normal amount obtained from inferior oils finds its equivalent in a smaller production of tar. Hence the author's plan for attempting to calculate from laboratory data the pecuniary value of an oil used for the manufacture of carburetted water gas is based on ascribing to the oil itself a certain fixed monetary value, multiplying the amount of hydrogen in the oil in excess (x) of 7 per cent. by 10—*i.e.*, expressing the said excess in parts per thousand—ascribing to each part per thousand of hydrogen a second fixed monetary value, and adding the two different items together. For example, taking the undecane mentioned in the last line of the table, the total proportion of hydrogen is 15·39 per cent., x being therefore equal to 8·39 and $10x$ to 84. If, now, the fictitious value of 250 pf. per 100 kilos is taken as the standard price for the oil itself (p), and the value of each part per thousand of available hydrogen is taken at 15 pf., the total carburetting value of undecane becomes $250 + (84 \times 15) = 1510$ pf., or 15·10 marks per 100 kilos.; whereas the value of the creosote oil in the third line of the table, which contains only two parts per thousand of hydrogen over the normal 7 per cent., is on similar lines made to be $250 + (15 \times 2) = 2{\cdot}80$ marks per 100 kilos. It is to be distinctly understood that this method of calculation is applicable only to the heavy oils used for carburetting water gas by the hot process, and not to those volatile spirits which are employed in the cold; also that the two different prices used in calculating the values must be so selected as to suit local conditions. In the table they are quoted according to the German practice in pfennige per 100 kilos. In England they would have to be given in shillings per cwt. The figures regarding the iodine values of the different oils amply prove that the constant bears no relationship to the practical value of the material as a means for carburetting water gas.

Dr. Spiegel's method has been applied satisfactorily for calculating the carburetting value of the oils recently employed by Dr. Leybold for the manufacture of carburetted water gas at the Brussels works. Still, it may be objected that the number of samples hitherto examined is too small to show whether or not the method is universally applicable. The author himself feels that more study of the subject is needed, especially with regard to the judiciousness of taking the figure 7 for the normal proportion of hydrogen which possesses no carburetting value, as he has done for purely theoretical reasons. Further experiments are certainly required in order that the method may be compared with the results obtained when the oils are used on a large scale. It is doubtful, however, whether the comparison can be directly made against ordinary manufacturing results. To do so would prove expensive and tedious, and, moreover, the results would be vitiated by the difficulty of maintaining uniform and standard conditions in a large carburettor, and of ascertaining the true mean calorific value of the gas owing to the differences in its composition at different stages of the manufacturing operation. For these reasons Dr. Spiegel believes that his method of calculation ought to be compared against the figures given on making carburetted water gas on a laboratory scale, where, with the aid of electric heat and a thermo-couple, the process can be carried out at a predetermined temperature and speed, and where the calorific power of the carburetted water gas (which is a more important factor than its illuminating power) can be measured accurately. Working on a laboratory scale, too, with the aid of a gas contained under pressure in a cylinder, investigations can be made into the effect produced by carburetting pure hydrogen, or pure carbon monoxide, and upon the influence exerted by varying proportions of carbon dioxide in the latter. The electrically-heated carburettor would also throw light upon the question whether the increased yield which can be obtained by increasing the temperature may not also be obtained in a shorter time by increasing the heating surface.

Naturally, the absolute carburetting power of any oil would be best determined by measuring the number of heat units added to water gas by the decomposition of unit weight of gas oil; and such a method of examination would be preferable to the arithmetical process suggested by Dr. Spiegel, were it not for the fact that facilities for carrying out ultimate analyses are present in every laboratory, whereas the apparatus required for the calorimetric estimation is less commonly at hand. Moreover, the direct method would not give accurate results as to the proper price of a gas oil unless corrections were made for variations in the quality of the tar. Nevertheless, it must be remembered that the arithmetical method would lead to mistakes if gas oils were to appear on the markets which contained an appreciable quantity of any substance having the character of decahydronaphthalene. This body contains 13 per cent. of hydrogen, and therefore is made by Dr. Spiegel's method to appear a very valuable carburetting agent, although, as Leroux has shown, it decomposes at a red heat into hydrogen and naphthalene, which are altogether devoid of carburetting value.

The Institution of Gas Engineers and Methods of Carbonization.—A circular has been issued by the Secretary of the Institution (Mr. Walter T. Dunn), informing the members that, in connection with the Special Purposes Fund, a Sub-Committee consisting of Messrs. Thomas Glover, S. Y. Shoubridge, and A. E. Broadberry, has been appointed to investigate and report on any methods of carbonizing likely, in a noted degree, to increase the value of gaseous and residual products from coal, or in other ways to reduce costs of manufacture. The members are asked, if any instances of exceptional results worthy of consideration have come under their notice, to furnish particulars of them. The hearty co-operation of all members of the Institution is invited; it being hoped in this way to obtain information which may be of great value to the gas industry.

REGISTER OF PATENTS.

Charging Retorts, Furnaces, &c.

QUENEAU, A. L. J., of South Bethlehem, Penn., U.S.A.

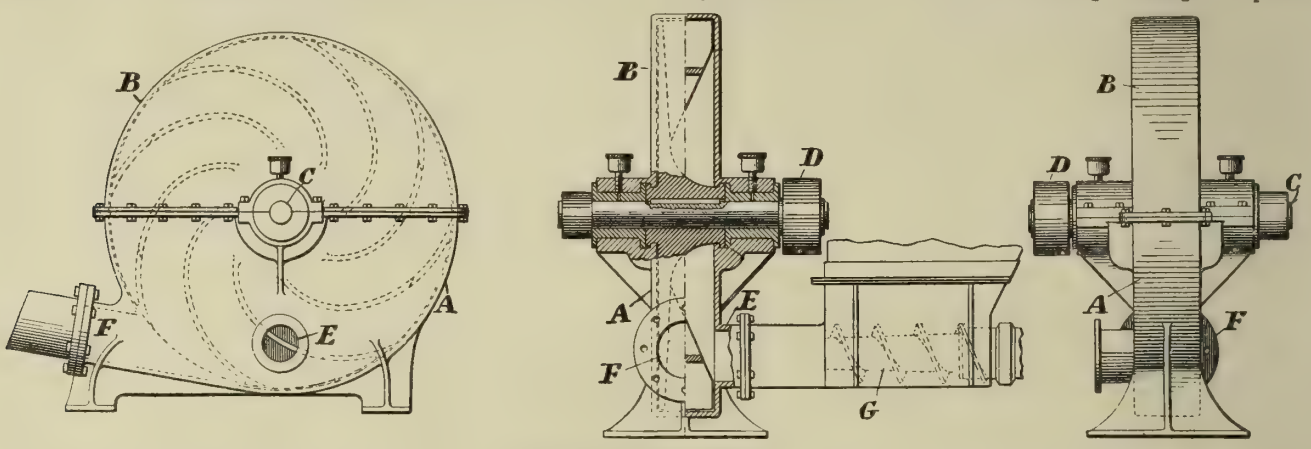
No. 1101; Jan. 15, 1906. Date claimed under International Convention, Jan. 16, 1905.

This charging machine comprises an enclosing casing, a rotary shaft, a series of impact blades, an inlet for feeding the material to be charged into the path of movement of the outer ends of the blades, feeding mechanism arranged in the inlet and terminating in advance of its discharge mouth (thereby serving as a seal against the admission of air with the charging material), and a tangential outlet.

The casing of the machine is made up of a base casting A and a top casting B, provided with projecting flanges for bolting them together. Between the two is journaled the shaft C (adapted to be revolved by the drive pulley D), upon which is keyed an "impeller disc," consisting preferably of a single casting having a hub portion with end flanges, a flat main body portion (constituting a circular plate corresponding in diameter to the internal diameter of the casing), and a series of curved blades. At their outer ends, the blades are of a width corresponding to that of the casing, and then continue of this width to a radial distance corresponding to the lower portion of the feed inlet E, from which point they decrease in width until they merge into the surface of the disc. Thus any material forced into the casing through the opening E will receive the full impact blow of the extreme outer portion of the blade approaching at that particular instant, and, dropping in front of the widest and outermost portion of the blade, and at right angles to it, will have imparted to it a momentum equivalent to that due to a sharp blow. In consequence, the material will be driven out tangentially through the upwardly inclined outlet spout F. The function of the extension of the pipe F is to give form and direction to the issuing stream of charging material; and, in this regard, it "acts, in a measure, like the barrel of a gun, to insure against scattering of the projected particles." In some instances, if desired, a forked pipe section may be employed, so as to simultaneously charge two or more vessels at one and the same time.

In practice, says the patentee, the material supplied to the charging machine would be fed, from a hopper, into the inlet opening E, by means of a feed-screw G, delivering into a pipe bolted to the inlet pipe E, so that the charging machine will be thus supplied with a forced feed, which may be so regulated as to correspond exactly to the conditions of use, and particularly to the speed of revolution desired.

The speed of revolution of the "impeller disc," and the speed of revolution of the conveyor screw, are so adjusted with respect to each other as to furnish "a resultant stream of material corresponding to the particular requirements of use." In practice, the patentee says he has produced a stream of material, which, shot through the outlet, travels in a straight path, without any material spreading, for a distance varying from 3 to 10 feet and more—the charge moving in a practically



Queneau's Retort-Charger.

solid, homogeneous column, of generally cylindrical form, so that it can be directed into a retort or muffle opening of small diameter. The obtaining of this non-spreading, solid and homogeneous column, is due, in great measure, to the fact that the casing is sealed, at all times, by the material fed into it, so that practically no air can enter with the material into the casing. The feed screw G (as will be seen) terminates in advance of the discharge mouth of the inlet—thereby leaving an intervening portion, which is constantly packed full of the material, and which remains full whether the feed screw is in operation or not. "There is, therefore, no indraft of air into the casing, and the column of material which issues through the tangential discharge spout is practically devoid of air. If air were present, as an element of the column projected from the tangential discharge spout, it would tend to expand and scatter the material on its way to the retorts, and the air within the retorts would itself oppose such resistance to the entrance of a column of material containing air, that additional scattering would take place at the retort mouths."

Discharging Coke from, and Charging Coal into, Gas-Retorts.

FIDDES, W. W., of Bristol, and ALDRIDGE, J. G. W., of Victoria Street, Westminster.

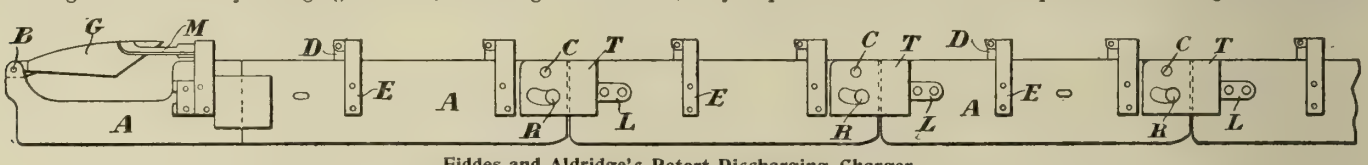
No. 5375; March 5, 1906.

This invention relates more especially to apparatus that discharges and charges simultaneously through gas-retorts, consisting of two stiff or jointed side pieces held together by distance-pieces and having swinging push-plates adapted to push the coal from a movable bed plate outside the retort directly on to and along the bottom of the retort while the front end is pushing out the coke—the coal being automatically supplied to the bed plate in the desired quantity as the charger advances into the retort. It has for its object (1) to level the surface of the deposited coal and to prevent coal being withdrawn from the retort during the return stroke of the discharging-charger, by means of a reverse plough fixed rearwards on the front push-plate at a suitable height; (2) to balance or hinge the divisional plates so that they bear only lightly on the coal on the return stroke; and (3) to drive the chain or jointed sides of a jointed discharging-charger by means of notches cut in the sides or slight projections on the chain and corresponding projections on the wheel on which the jointed discharging-charger is wound—thus reducing as much as possible all internal projections.

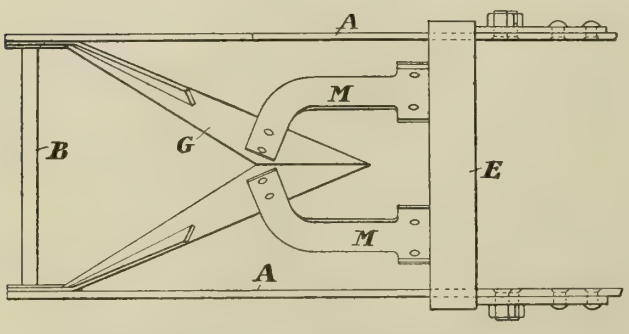
The outsides of the side pieces of the discharging-charger are provided with fixed or butt jointed projections to conform more nearly to the shape of the retort and assure a clean discharge.

The illustrations show the hinged or jointed discharging-charger constructed according to this invention, and an enlarged plan of the plough.

The discharging-charger comprises two parallel side plates A held together by transverse distance-pieces or stays E and hinged together at C in the form of a chain. A stud R working in a curved slot in a hinge-plate T is provided to take the thrust off the centre pins or pivots C when the charger is operated. Suitable pivoted push-plates D are suspended between the side plates from the brackets or arched stays E placed at suitable distances apart in the fire length of the chain.



Fiddes and Aldridge's Retort Discharging-Charger.



The plates are adapted to come against stops F when the charger is entering the retort. They are constructed as light as possible, and are curved to give increased strength "so as to pass lightly over the surface of the coal on the return stroke without withdrawing any coal from the retort."

A reverse plough G, supported rearwards on the front push-plate, is firmly held at one end by stays M attached to the arched stay E and at the other by the stay B to even (on the return movement) the coal that has been deposited on the bed of the retort by the forward movement of the charger. The sides of the front chain link are cut away to allow the plough not only to level the coal between the chain, but to spread it evenly to both sides of the retort.

In operation, the discharging-charger is brought in front of the retort mouthpiece, and a forward movement is imparted to it, while at the same time coal is fed from a hopper or shoot into the spaces between the push-plates. As the charger is moved forward, the coal is pushed along the bed plate and carried by the push-plates into the retort. On the entry of the charger into the retort, the front push-plate imparts a forward movement to the coke in the retort, discharging it from the furthermost end. On the return movement of the charger,

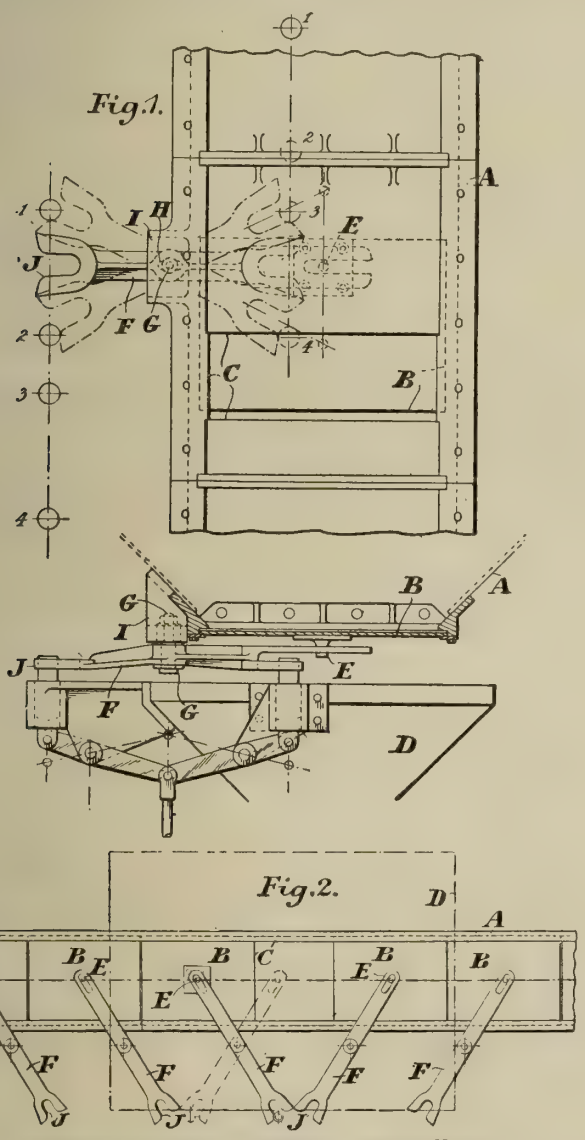
the push-plates take up an inclined position, and are balanced so as to bear only lightly on the surface of the coal—the levelling being finally completed by the reverse plough G, which distributes the coal evenly to both sides of the retort. "By this means it is possible to insert a full charge and distribute it evenly over the whole surface of the retort."

Charging Gas-Retorts, Coke-Ovens, &c.

ALDRIDGE, J. G. W., of Victoria Street, Westminster, and GIBSON, R. E. of Liverpool.

No. 4712; Feb. 26, 1906.

This invention relates to an apparatus in which a charging machine carrying a receiver hopper is traversed underneath a fixed or supply hopper from which the coal is delivered to the machine through the hopper. Hitherto, the patentees say, the charging apparatus has been supplied from a hopper having a single door that is opened by the apparatus as it passes into position under the hopper and is closed by the apparatus as it passes back again to the retorts; or, alternatively, the supply hopper has been provided underneath at the places where it is desired to supply the movable receiver hopper with slide doors that have to be opened and shut by hand, either by a single handle mounted on the traversing apparatus and automatically engaging with shutters and operated by hand to open or shut, or else by separate levers fixed on, or near to, the supply hopper operated by hand. But, according to this invention, the shutters in the fixed or supply hoppers are operated entirely automatically in such manner that, as the charging apparatus is traversed to its different positions, it automatically engages with, and opens and closes, them.



Aldridge and Gibson's Automatic Charging Hopper.

In fig. 1, the supply hopper A is provided with slide-doors B, adapted to close the openings C, through which coal is delivered to the receiving hopper D of the charging apparatus. The openings C are arranged mid-way between the retorts, so that the charge of coal is delivered to the hopper D as the charging machine travels from one retort to the next. On the underside of each door a pin or stud E is fixed, and engages in the slotted or bifurcated end of the operating lever F, which is pivoted on a bolt G inserted in a slot H in a bracket I on the hopper, so that it is adjustable.

The lever is capable of operating the doors, to open and close them while the charging machine is travelling in either direction. For this purpose, it is provided with open-ended slots at opposite ends, which engage with pins or rollers supported on brackets on the chamber D. The inner ends of the levers are each divided horizontally into two branches or arms of unequal length, in which the respective slots are formed. As the charging machine is traversed along the rails in front of the retorts, a pin or roller engages one slot and turns the lever about its pivot until the other end, acting on the pin E, has completely opened the door B. At this point the pin or roller leaves the slot; and when the charger has travelled a predetermined distance (depending on the position of the two rollers), the closing pin or roller commences to act in the slot on the opposite end of the lever.

The numerals 1 to 4 indicate the relative positions of the rollers or pins—1 showing the position when the door is about to be opened, 2 the position when the door is fully open, 3 the position when the door is about to be closed, and 4 the closed position.

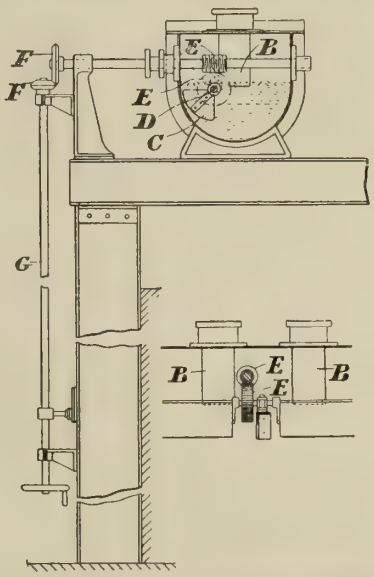
In the modified form shown in fig. 2, the same principle is involved; but instead of opening and closing each door in the supply bunker before passing on to the next, a series of doors or sliding plates B are moved by the charger in succession, so that the opening C is as it were traversed forward along with the charging apparatus and receiver hopper D. As the charging apparatus is traversed backwards, the motion of the doors is reversed, and the opening C is again traversed along with the charger. The levers F are formed with slots J adapted to engage a pin or roller K on the receiver hopper D, the inner ends of the levers having slots only for engagement with the pins E on the doors.

Hydraulic Mains.

EWING, W., of Greenock.

No. 11,125; May 12, 1906.

This invention has for its object to provide mechanically operated means whereby the usual seal may be maintained to prevent the influx of air while the retorts are being charged, and removed to allow free passage of the gas into the hydraulic when the retorts are closed and used for generating gas, "so that the larger production of gas known to be obtainable by the absence of sealing pressure may be secured."



Ewing's Hydraulic Main Sealing Arrangement.

The hydraulic main and pipe connections from the benches of retorts are arranged in the ordinary way; but such a lower level of liquid is maintained in the main that the lower ends of the dip-pipes B do not normally dip into the liquid, and are therefore not sealed. In order to raise the fluid level when required to seal the dip-pipes, a displacer C is fitted within the hydraulic main normally over the liquid level (as indicated by dotted lines) and brought down into the liquid to the position indicated by full lines so as to raise its level and seal the dip-pipes. By preference the displacer is pivoted on a spindle D carried through the hydraulic main and operated by gearing such as the worm gears E and bevel pinions F from a hand-wheel shaft G within easy reach of the retort attendant. When about to recharge the retorts, he operates the gear to bring down the displacer into the liquid and form the requisite seal to prevent the influx of air to the main; and when the retorts are recharged and working again, he operates the gear to raise the displacer and thus remove the seal, so that the gas freely passes into the main.

Rendering Heavy Coal-Tar Oils Odorless.

WIRTH, E., of Dortmund, Germany.

No. 24,344; Oct. 31, 1906.

The so-called anthracene oils or grease oils and those fractions having a higher boiling point possess, as is well known, says the patentee, a characteristic sharp odour which cannot be eliminated by distillation. It is "objectionably noticeable" in sundry applications of the oils, and is probably due to the sulphur compounds which they contain. With other mineral oils, similar sulphur compounds can be removed by treatment with metals or metallic salts; but this process does not effect the desired result in the case of the coal-tar oils. For these substances, a more intense reaction of the metallic salts is necessary—as, for example, is described in the German patent No. 153,585. This process, however, involves considerable cost, and, moreover, the oils suffer internal change due to the energetic treatment.

Experiments have, however, shown the patentee that the highly odorous substances contained in tar oil can be converted by treatment with sulphur under heat into less volatile, odorless combinations—the change taking place at a temperature of from 90° to 100° C. In general, an addition of from ½ to 1 per cent. of sulphur suffices; and the reaction is usually accompanied with the formation of slight quantities of sulphuretted hydrogen.

The treatment of tar oils with sulphur has already been proposed—see, for example, the German patent No. 139,843. In this process

however, large quantities of sulphur are employed at so high a temperature (220° to 250° C.) that the tar oil itself undergoes chemical changes, and is converted into a product which is quite different from the initial substance. But in the present process, the various properties of the raw tar oil are said to be retained without alteration with the exception of the smell; "so that the product can be applied to its various uses equally as well as the raw oil."

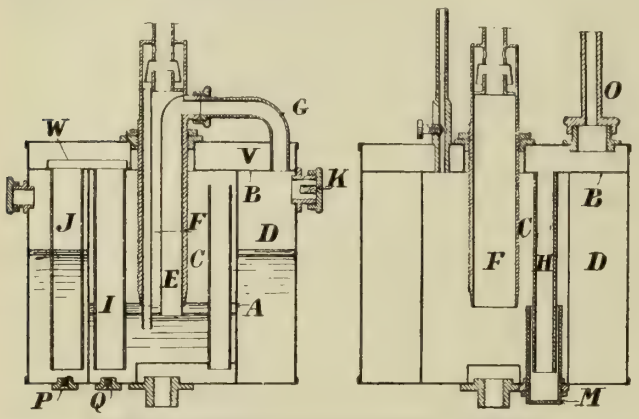
As an example, the patentee says: 10,000 kilogrammes of heavy coal tar oil are heated to about 100° C., and a quantity (varying according to the quality) of from 50 to 100 kilos. of ground sulphur is added thereto. This sulphur is quickly dissolved; the reaction being assisted by stirring (preferably through the medium of an air current) and ceasing in about half-an-hour. Any excess of sulphur is not separated out on cooling, as these oils dissolve when cold as much as 7 per cent. of sulphur. The product, after being cooled, is "ready for immediate use and possesses at the most a weak, soft odour."

Lighting and Extinguishing Gas-Burners.

BAUDUIN, J. G. H., of Maastricht, Holland.

No. 24,432; Nov. 1, 1906. Date claimed under International Convention, March 3, 1906.

In the "JOURNAL" for March 5 (p. 626), an arrangement was fully described and illustrated by which the patentee claimed to be able to light and extinguish gas-burners, with certainty, from a distance; and the present invention is a modification—designed "to enable such apparatus to work satisfactorily even when the quantity of oil constituting the opening and closing liquid [in the operating chamber] varies, owing to changes of temperature, and consequent variation in the percentage of benzol that is dissolved in the oil."



Bauduin's Lighting and Extinguishing Apparatus.

In the example shown, the internal cylindrical wall A (in contradistinction to that described in the earlier specification) extends upwards to the level plate B, to which it is soldered, so that the only communication for the gas between the compartments C and D is through a pipe E arranged within the pipe F and connected to a flexible pipe G, which leads to an opening in the horizontal plate B. The pipe E extends below the lower end of the pipe F for a certain distance—for example, 3 mm.—so that the gas cannot pass through the pipe except when there exists in the compartment C a pressure exceeding by from 5 to 6 mm. the pressure at which the pipe F is opened by the liquid contained in the compartment C. During the whole of the time that the pressure remains below the upper pressure indicated, the compartment D remains under atmospheric pressure, and is in communication with the exterior through a small hole K.

The apparatus is charged through the inlet O with a non-volatile and non-freezing oil (the density of which remains practically constant at the temperatures at which the apparatus is to work); the oil flowing through the pipe H into the compartment C. The apparatus is now connected to a supply of gas at the pressure "r mm." at which the burner is to be lighted. The pressure in the compartment C now causes oil to rise through the pipe I to the level of the plate B, and to flow thence, through the pipe J, into the compartment D. Since this compartment remains open to the atmosphere at K, oil continues to flow into it until it overflows through the side aperture, which is then closed. The oil in the compartment C being now under a pressure of "r mm.," its level is at a distance from the horizontal plate B of "r mm." divided by the specific gravity of the oil, while the tubes H and I are full. The position of the pipe F must now, if necessary, be adjusted so that its lower end is above the level of the oil in the compartment C. For this purpose the flexible pipe G must be disconnected from the pipe F, to which it is again connected after the adjustment of the latter. If the pipe F is in communication with the burner, the latter is lighted.

In order to extinguish the burner, it is necessary to increase the gas pressure to "r + 10 mm.," and to maintain this pressure for about two minutes. When this increase of pressure takes place, the level of the oil in the compartment C falls to a distance below the plate B of "r + 10 mm." divided by the specific gravity of the oil, which consequently flows through the tube H into the chamber V, and through the tubes I and J into the compartment D only. By the lowering of the level of the oil in the compartment C, the lower end of the pipe E is unsealed, and the gas consequently passes through the pipes E and G into the compartment D. The pressure of the gas on the oil in the compartment D now forces oil up the tube J and over the wall W to join the oil that has passed through the tube H to the upper side of the plate B. If the pressure is now suddenly reduced to "r − 5 mm.," the oil above the plate B and outside the wall W is compelled to pass into the compartment C through the pipe H; and the result is that the tube F becomes sealed at its lower end, and the supply of gas to the burner is thus cut off.

In order to relight the burner, the gas is restored to the pressure "r" for about one minute; and as the level of the oil is at a distance below the plate B less than "r mm." divided by the specific gravity of the oil, it is forced from the compartment C, through the tubes I and J, into the compartment D until the lower end of the tube F is again opened by the oil in the compartment C.

When the burner is lighted, only the oil in the tubes H and I can enter the compartment C; and since the cross sectional areas of these tubes are together considerably less than that of the compartment C, the amount of oil in the tubes H and I is not sufficient to seal the tube F, so that the supply of gas to the burner is not interfered with even if the pressure of gas be reduced to as little as "10 mm."

A further object of the invention is to enable one or more of the burners connected to the common source of supply to be extinguished at a different time to the others. For this purpose the oil receptacles of the burners that it is desired to extinguish are each provided with a pipe M (closed at its lower end) extending up through the bottom of the receptacle, so that it can be adjusted in height therein, and the upper end of which is a little above the lower end of the pipe F. The pipe M is arranged concentrically with the pipe H, and surrounding the latter for part of its length. When, now, the pressure of "r + 10 mm." is given for about two minutes, oil collects on the plate B of each of the oil receptacles connected to the common source. If the pressure is now slowly reduced, the oil on the plates B and outside the walls W of those burners that are unprovided with tubes M flows through their pipes H into their compartments C, and at the same time oil is forced from the compartment C through the pipes I and J into the compartments D, in consequence of the communication of the compartment D with the atmosphere through the opening K. The corresponding burners consequently remain lighted. The oil on the plate B and outside the wall W of each receptacle provided with a tube M likewise flows down its pipe H, but is caused by the pipe M to rise above its upper end; and as the upper end of the pipe M is higher than the lower end of the pipe F, and consequently at a less distance below the plate B than "r mm." divided by the specific gravity of the oil, oil remains on the plate B from the moment the pressure commences to decrease until the pressure becomes "r." On a further reduction of pressure, the oil on the plate B flows into the compartment C, and, as the pressure in the compartment C is now insufficient to force oil from it into the compartment D, the oil flowing down the pipe H closes the lower end of the pipe F.

In order to extinguish the remainder of the burners, the pressure of the gas must again be raised and then suddenly lowered, as described.

Incandescence Gas-Mantles.

THORPE, C. P. E., and DOUGAN, O. W., of Wandsworth.

No. 13,181; June 7, 1906.

To increase the toughness and durability of mantles, the patentees propose to treat them with a solution of mercuric chloride ("corrosive sublimate"), which has been found "to give more satisfactory results than any other of the various salts of mercury."

A strong (preferably saturated) solution of corrosive sublimate is prepared by dissolving the latter in water, and the mantles—the ordinary kind at present upon the market—are dipped into the solution, and then supported until dry—by mere exposure to the atmosphere or by artificial heat.

The dried mantles will, it is said, be found "considerably more tough and durable than previous to such treatment, while their luminosity is inappreciably affected."

APPLICATIONS FOR LETTERS PATENT.

5780.—HELPS, G., "Mantles." March 11.
5793.—FARNAM, R. V., "Suction-gas plant." March 11.
5939.—VAN WYE, G. P., "Gas-heaters." March 12.
5960.—BUREL, M., "Gas-stoves." March 12.
6006.—BOWDEN, J. H., ROBINSON, J. A., and JACKS, A. H., "Prepayment meters." March 12.
6023.—MARKS, E. C. R., "Cooling, washing, or enriching of gases." A communication from Act.-Ges. für Kohlendestillation. March 12.
6027.—HINTON, E., and ANDREWS, F. A., "Gas cup-and-ball joints." March 13.
6063.—WILLINGHAM, E. R., "Two-stroke cycle internal combustion engines." March 13.
6115.—HOEK, J. D., "Gas-stove." March 13.
6140.—SYER, M., and TAYLOR, S., "Valve for gas." March 14.
6133.—PRIEST, C. F., and FENN, G., "Gas-producers." March 14.
6164.—PRIEST, C. F., and FENN, G., "Gas-firing of kilns." March 14.
6179.—MACFARLANE, R., "Pilot lighting device for incandescent gas-lamps." March 14.
6183.—KEITH, J. & G., "Making air gas." March 14.
6316.—WELLINGTON, S. N., "Photometers." March 15.
6320.—EWART AND SON, LTD., and EWART, G. H., "Gas-regulating valves for water-heaters." March 15.
6322.—HARDT, J. W., "Gas-light apparatus." March 15.
6323.—FAIRWEATHER, W. C., "Incandescent gas-lamp." A communication from the firm of Julius Hardt. March 15.
6348.—THE BRITISH THOMSON-HOUSTON COMPANY, LTD., "Gas-meters." A communication from General Electric Company. March 15.
6401.—ELLIS, W., "Gas-fittings." March 16.

Douglas Town Council and the Gas Company.—The Douglas Town Council have instructed the Lighting Committee to call upon the Gas Company to guarantee an illuminating power of 16 candles, and to comply with prescribed tests, failing which to have an Arbitrator appointed. A Special Committee have also been instructed to have new legislation introduced, bringing the duties and services of the Company into line with modern requirements as regards power and purity, the supply to private consumers, reasonable limits as to profits and dividends, and charges for cooking, heating, and power.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by our Correspondents.*]

"Coalite."

SIR,—Is there any novelty in this fancy-named substance? I remember, in the discussion on Sir Charles Cookson's paper at the Smoke Abatement Society's conference last summer, that one of the speakers described what appeared to be a process identical with that for the production of "Coalite." But to stop the process of gasification is surely absurd in these days of the Welsbach burner. We want more gas of lower illuminating value, rather than less gas of a higher value. The tendency is to lower the candle power; and rightly so.

ECONOMY.

March 21, 1907.

Increased Storage or Additional Retorts.

A correspondent would be glad to have an expression of opinion on the above question, which has arisen under circumstances which he sets forth as follows: At present we have two gasholders—one holding 18,500 and the other 14,400 cubic feet, making a total (say) of 33,000 cubic feet. Our greatest day's make is 55,000 cubic feet. It is generally understood that the gasholder capacity should equal the greatest day's make in the year; therefore we are 22,000 cubic feet short of proper storage room. Our difficulty is this: For a time on each side of Christmas, with both holders full at 4 p.m., by 8 p.m. one would be down, and by 11.30 p.m. the other also, within a foot or two, which is dangerously near being out of gas altogether. I have told my Directors that there are only two ways of meeting the matter—one to put up an additional holder, and the other to increase the number of retorts (*i.e.*, by another bed). I said the proper way was to increase the holder room, as being the most economical—that providing more retorts to meet an intermittent demand was both a wrong and a wasteful principle. Am I right or wrong?

Liability for Non-Supply of Gas.

A correspondent writes: At our last meeting of Directors, the above question was discussed; and, in view of the unsettled state of the coal question as to prices, and the possibility of a strike, it was considered by some that gas companies were in a very serious position in the event of a strike, as, according to the Gas-Works Clauses Act, 1871, there is no exemption from penalties should the gas supply fail from any cause whatever. In 1892, we obtained a Provisional Order, in which, I believe, we are exempt from any penalty, if it is proved that the failure results from unavoidable cause or accident. As clause 37 says: "No penalty shall be incurred by the undertakers for insufficiency of pressure, defect of illuminating power, or excess of impurity in the gas supplied by them in any case in which it is proved that such insufficiency, defect, or excess was produced by an unavoidable cause or accident." I shall be glad to be informed of an instance in which a gas company have been convicted, in case of failure of supply in consequence of a strike. It appears to me to be a great injustice to gas companies who have not a similar clause to ours—and I believe there are many—as by the 1871 Act there is no doubt as to a company being liable for failure of supply. Are the electric light companies under a similar penalty?

The Experiments with Inclined Retorts at Guildford.—A correspondent who (as a Director of a Provincial Gas Company) has watched for a considerable period the various new processes introduced in connection with the manufacture of gas, writes on the above subject as follows: "I have never seen or read of a scheme for the improvement of the manufacture of gas which seemed to me to promise such important results. Unless unforeseen difficulties should be met with in carrying this method into practical use, I venture to think it will revolutionize the system of manufacture. Keeping the newly extracted gas in contact with the coal in its passage through the retort is, to my mind, a novel and important feature."

The Purchase of the Pontefract Gas-Works.

A circular to the shareholders of the Pontefract Gas Company has been issued by Mr. R. D. Ryder, the Secretary, in which he states that the Directors propose to divide the £69,600 awarded by the Umpire (Sir Hugh Owen) as the price to be paid by the Pontefract Corporation for the purchase of the undertaking of the Company (*ante*, p. 703), at the rate of £25 for each original (£10) 10 per cent. share, and £17 10s. for every new (£10) 7 per cent. share. This will leave a balance of £1600, out of which the Company will have to pay such costs of the arbitration as may not be allowed on taxation; the balance, of course, being further divisible among the shareholders. The Corporation have to pay off the mortgage debt (£5000), the taxed costs of the arbitration, and the winding-up expenses of the Company, as well as the maximum dividends up to July 1 next. The 10 per cent. shares, when last sold by auction, realized £25, and the 7 per cent. £16 2s. 6d., though it is reported that the former have since changed hands privately at as high as £27 10s.

Llandudno Gas Managership.—At the last meeting of the Llandudno Urban District Council, Mr. M'Master reported that 130 applications had been received for the position of Gas Manager; and a tabulated list would be supplied to every member. Mr. Sarson complained that the works had now been left for three months without responsible management, and that the Gas Committee were dilatory in recommending a successor. Mr. M'Master, however, protested against these aspersions, and assured the Council that they would be very agreeably surprised when they received the figures for the three months which had elapsed since the late Gas Manager's resignation, and since Mr. Morton and others had had control of the works.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Sheffield Corporation Bill, Aberdeen Corporation Bill.
Bill reported, with amendments: Devonport Corporation Bill.
Bill read the third time and passed: Newquay and District Water Bill.

The Birkenhead Corporation Water Bill has been referred to a Select Committee, consisting of Lord Newton (Chairman), Viscount Hampden, Lord Teynham, Lord Ravensworth, and Lord Weardale; to meet on Tuesday, the 23rd prox.

The Portishead District Water Bill, Selsey Water and Gas Bill, Southend Water Bill, Tees Valley Water (Consolidation) Bill, and Tynemouth Corporation (Water) Bill have been referred to a Select Committee, consisting of the Earl of Lauderdale (Chairman), the Earl of Scarborough, the Earl of Carnwath, the Earl of Verulam, and Viscount Colville of Culross, to meet on the above-named day.

The Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill, Broadstairs and St. Peter's Urban District Water Bill, Colne Valley Water Bill, Coventry Corporation Water Bill, Great Yarmouth Water-Works and Lowestoft Water and Gas Bill, Pontypridd Urban District Council Bill, Southport, Birkdale, and West Lancashire Water Board Bill have been referred to a Select Committee, consisting of Lord Ribblesdale (Chairman), the Duke of Wellington, Lord Zouche of Haryngworth, Lord Seaton, and Lord Ritchie; to meet on the above-named day.

The Glasgow Corporation Bill and the Renfrewshire Upper District (Eastwood and Mearns) Water Bill have been referred to a Select Committee, consisting of the Earl of Camperdown (Chairman), the Marquis of Bath, the Earl of Hardwicke, Lord Faber, and Lord Haversham; to meet on Tuesday, the 30th prox.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read the first time and referred to the Examiners: Newquay and District Water Bill [Lords].
Bill read a second time and committed: Boston Spa Gas Bill.
Bills reported, with amendments: Brockenhurst Gas Bill, Maidstone Gas Bill, Mitcham and Wimbledon District Gas Bill.
Bills read the third time and passed: Gas Companies' (Removal of Sulphur Restrictions) Bill, Llandrindod Wells Gas Bill.

The Metropolitan Water Board (Charges, &c.) Bill and Metropolitan Water Board (Various Powers) Bill are to be considered by a Joint Committee of the two Houses.

UNOPPOSED GAS BILLS.

On Friday, the Unopposed Committee of the House of Commons had under consideration three Gas Bills. Mr. ALFRED EMMOTT (Chairman of Ways and Means) presided; and the other members present were Mr. J. CALDWELL (Deputy-Chairman), Mr. J. W. HILLS, and Mr. J. J. MOONEY.

Brockenhurst Gas Bill.

By this Bill powers are sought for the incorporation of the Brockenhurst Gas Company with a capital of £15,000, to acquire land, and to construct works in the parish of Brockenhurst, Southampton.

Mr. BAKER (Parliamentary Agent for the Bill) said that Brockenhurst was a residential district; and the Company sought powers to supply gas there. In addition to the £15,000 capital, they asked for the usual one-third borrowing power. The maximum price was 5s. per 1000 cubic feet.

The CHAIRMAN: Why do you want 5s.? You are close to the coast; and it cannot be expensive to get coal there.

Mr. BAKER: It is some distance away.

The CHAIRMAN: But how far?

Mr. BAKER: It is not far from Southampton; but there is the freightage from there.

Mr. CALDWELL asked what was the price of gas in adjoining parishes.

Mr. *E. H. Stevenson* (who was called to prove the preamble) replied that in small places of this description the price of gas generally started at about 4s. or 4s. 6d. per 1000 cubic feet.

The CHAIRMAN inquired whether there was a sliding-scale.

Mr. BAKER replied that it was not usual in a new company to have a sliding-scale.

Mr. *Stevenson* stated that the proposal had been before the Local Authorities; and the Bill had received their assent.

The CHAIRMAN: There are no reports from Government Departments, are there?

Mr. BAKER: No.

The Bill was ordered to be reported.

Maidstone Gas Bill.

[Mr. CALDWELL took the chair, as Mr. Emmott was called away at this point.]

The proposal of the Maidstone Gas Bill is to extend their limits of supply to Harrietsham, Lenham, Bromfield, Chart-next-Sutton Valence, East Sutton, Sutton Valence, Ulcomb, Boughton, Malherbe, and Hunton; to relieve the Company of restrictions imposed upon them in respect of sulphur compounds (except sulphuretted hydrogen); to lay down, make, and maintain a tramroad for the purpose of transporting coal, coke, and other products and materials to

and from the works of the Company and the South-Eastern and Chatham Railway; and to take power to charge 6d. per 1000 cubic feet more outside Maidstone than inside the borough.

Mr. ANDERSON (the Agent) explained the purposes of the Bill; and said that, with regard to the removal of the sulphur restrictions, they had adopted the clause from the Act passed last year. Dealing with the question of the price of gas, he said they had three zones of charges. Under their existing Acts, the standard price for the borough of Maidstone for a radius of 1½ miles was 3s. 7d. per 1000 feet; between that zone and 4 miles, it was 4s. 4d.; and they were now asking to charge an additional 6d. in the places to which they were taking gas. The figures he had mentioned were maximum charges. They were actually charging for Maidstone and 1½ miles 2s. 4d.; the next zone had to pay 3s. 1d.; and the outside places would have to pay 3s. 7d. These outside parts wanted the Company to come in; and those which were actually supplied with gas at the present time were paying 4s. 9d. per 1000 feet.

The CHAIRMAN: What is your dividend at present?

Mr. ANDERSON replied that they paid £7 12s. 6d.

The CHAIRMAN: Have you any money invested for renewals?

Mr. ANDERSON: We have a reserve fund of £5000. The Bill was opposed by the Maidstone Corporation; and we have settled with them. They did not object to our having a renewal fund clause in the Bill.

The CHAIRMAN: Have you a sliding-scale?

Mr. ANDERSON: Yes. Though I used the word "maximum," it is a sliding-scale company, and not a maximum price company. We also had opposition from the Sutton Valence Gas Company; but we settled that by buying them out.

Mr. MOONEY: Are you reducing your illuminating power?

Mr. ANDERSON: No. We are taking the new form of test, that is all. This is the Model Bill clause.

Mr. HOAR (Solicitor to the Company) having proved the preamble, the Bill was ordered to be reported.

Grays Gas Bill.

The objects of this Bill are to re-incorporate the Grays Gas Company, to extend their area of supply, and to increase the capital from £64,000 to £150,000, and allow one-third of the latter figure as borrowing powers.

Mr. BAXTER (the Agent) said that the Bill was opposed by the two Local Authorities, who went carefully into the matter, and amendments had been made which had satisfied them.

The CHAIRMAN: What is your present charge?

Mr. BAXTER: Under our Order of 1881, the Company have the power to charge 6s. per 1000 cubic feet within a radius of a mile of the gas-works, and 6s. 6d. beyond. That is the maximum, of course. What we have been charging is 4s. We have the sliding-scale applied to us; and we seek to make the standard price 4s. 4d. in the inner circle, and 6d. extra outside. But within the inner circle we put the whole of the district of Grays, to meet the opposition of the Local Authority.

The CHAIRMAN: How do you work your sliding-scale?

Mr. BAXTER: We have made an amendment to give effect to the requirement of the Local Government Board; and the clause now follows the section of the Crediton Gas Act, 1906, to which the Board refers.

Mr. HILLS: What are you paying in dividends?

Mr. BAXTER: On our "A" shares the maximum is 10 per cent., and on our "B" shares 7 per cent. Last year we paid 8 per cent. upon the 10 per cent. shares, and £5 12s. upon the 7 per cent. shares.

The CHAIRMAN: You have a renewal fund in clause 42, which is new. It is ½ per cent.

Mr. BAXTER: Clause 42 provides for a half-yearly payment—½ per cent. in any half year. That makes 1 per cent. in the year.

The CHAIRMAN: It has to come up to 10 per cent. on the paid-up capital?

Mr. BAXTER: Yes.

The CHAIRMAN: What is your present capital?

Mr. BAXTER: The authorized capital is: Under our first Order, £10,000; under the second Order, £30,000; and our third Order brought it to £88,000. Of that we have raised £64,000, so that we have some authorized capital not raised which will be extinguished by the present incorporation and will be included in the total capital asked for—viz., £150,000.

The CHAIRMAN: You want to bring the £64,000 up to £150,000?

Mr. BAXTER: Yes; and I think we convinced the Local Authority that this was a reasonable sum.

The CHAIRMAN: What is the additional capital required for?

Mr. *F. E. Bartlett* (Chairman of the Company) replied that they were applying for power to supply gas in five extra parishes; and it would nearly double their area of supply. In addition to this, the whole of their present district was growing very rapidly.

The CHAIRMAN said there were a good many new points in the Bill, the sliding-scale, renewal fund, and so on; and he thought it had better be left over till the next Committee meeting, so that the matters could be gone into very carefully.

The preamble of the Bill was, however, proved, subject to the clauses being found to be of a satisfactory nature.

Moscow in Darkness.—Following closely upon the recent strike of electric light workers in Paris, came one of gas workers in Moscow on Monday last week. Their action was ostensibly in support of the tramway hands; the water and electricity supplies were menaced for the same reason. All the municipal troubles were due to the refusal of the Town Council to dismiss their Engineer. As the result of the strike, the city was given over to disorder. Bands of hooligans paraded the streets, which presented a deserted appearance. Cabs disappeared from the ranks, and the police abandoned their usual posts and collected in groups, or sought cover under convenient arches. The few oil-lamps that emitted a feeble light were quickly smashed; and the boulevards were left in total darkness save for the light afforded by the stars.

MITCHAM AND WIMBLEDON DISTRICT GAS BILL.

House of Commons Committee.—Tuesday, March 19.

(*Before Sir* FREDERICK BANBURY, *Chairman, Mr.* FIENNES, *Mr.* RAPHAEL, *and Mr.* MOND)

The consideration of the clauses of this Bill was proceeded with to-day.

Mr. YOUNG (Parliamentary Agent for the Wandsworth Borough Council) thought some alteration should be made in clause 29*a*, which says: "Section 7 ('Testing Gas') of the Order of 1892 is hereby repealed." He pointed out that the promoters had only to construct the new testing-place within twelve months; and if by the new Act section 7 were at once repealed, there would be no testing-place for twelve months. He thought that the new clause should stipulate that the section referred to should be repealed as from the date on which the new testing-place came into use.

Mr. COOPER (for the promoters) said he was a little doubtful whether it was quite parliamentary to legislate that a certain thing should be done as from the date of something being erected. He thought there must be a specific date.

Mr. LEES (for the Wimbledon Corporation and the Croydon Rural District Council): There is a specific date. Within one year from the passing of the Act you have to put up the new building.

Mr. RAPHAEL suggested that the clause should read: "The Order of 1892 is hereby repealed from the date at which the provisions of this clause come into effect."

Mr. YOUNG: That will do. You cannot put a definite date.

Mr. LEES: You could put at the end of the clause "as from the time when this testing-place has been provided."

Mr. COOPER: Or the clause might read "As from the expiration of the said period, section 7 ('Testing Gas') of the Order of 1892 is hereby repealed."

After some discussion, the clause was made to read that section 7 was "repealed as from the date when the new testing-place and apparatus hereinafter provided for shall come into use."

Mr. YOUNG said there was a slight objection with regard to the addition to clause 34, as drawn. Mr. Balfour Browne, in his address, expressly said, and it was agreed to, that the mains were to be laid, under the superintendence of the Local Authority, at a depth not less than 2 feet below the surface. They had drawn it in this way: "Provided that, before laying or relaying such pipes, the Company shall give three previous days' notice thereof to the Local Authority concerned, who shall within 48 hours thereafter notify to the Company the reasonable depth, being not more than 2 feet." He said it should read not less than 2 feet." He was quite willing to add the words, "not "less than 2 feet nor more than 2 ft. 6 in." The object was this: In new streets the roads were very uneven; they were builders' roads, and it was often necessary to pare off 6 inches of the surface. If the pipes were laid not more than 2 feet down, it would bring them within 18 inches of the surface.

Mr. LEES: I support Mr. Young. Mr. Balfour Browne said "not less than 2 feet." The clause as drawn is a totally different thing. We only want to see that it is all right; and we ask them to stick to what Mr. Browne said.

Mr. YOUNG: Local authorities are being held liable now for damage to gas-mains by the use of steam-rollers, which must go over the road; and if the pipes are so near the surface ——

Mr. COOPER (interrupting): The original proposition was, in Mr. Fitzgerald's own notes, "Not more than 2 feet below the surface." That is the sole condition upon which, in consultation, we agreed to the clause at all. As the whole object of our proviso was that we should not render ourselves liable to have to lay mains at any depth they called upon us to put them at, it was necessary for us to prescribe a maximum depth of 2 feet. During the handling by Counsel, the clause got altered. Here is Mr. Fitzgerald's own copy. The words handed to him were "not more than," and he himself altered them at Mr. Vesey Knox's suggestion, and changed the word "more" to "less." In my copy it is "not more than." When Mr. Balfour Browne read it as altered by Mr. Fitzgerald, he (possibly not seeing the importance of it at the time) read "not less than." It would be very hard on the Company to hold them to that.

Mr. LEES: If you stick absolutely to the minutes of proceedings, you have "not less than." This would suit us. We are quite willing to meet Mr. Cooper. We do not want to be unreasonable. I quite agree with Mr. Young that if you put in "not less than 2 feet nor more than 2 ft. 6 in.," the promoters are absolutely protected, and we may have 6 inches to pare off. I think that is a fair suggestion on the part of the Local Authorities.

The CHAIRMAN: We are bound to take the minutes as they appear here, and especially as my recollection and that of the Committee is that the word was "less," and not "more." I think we must have "less;" but I can see that there is an objection to it. Therefore I propose to put in "not less than 2 feet nor more than 2 ft. 6 in. below."

The clauses of the Bill were then further proceeded with. When the schedule was reached,

Mr. RAPHAEL remarked that there ought to be something in the Bill to protect Mr. Pitt, the owner of the houses in the neighbourhood of the projected new gas-works.

The CHAIRMAN pointed out that the promoters had made the suggestion that a manufactory should not be put within 40 feet of the road. This, however, was not to be held to bind them not to build storage works, clerk's offices, or anything of the sort.

Mr. COOPER: We are quite prepared to give that undertaking, if it is asked for.

The COMMITTEE CLERK: What is the remedy if the undertaking is ignored?

Mr. LEES: There is no remedy with regard to a statutory company, unless it is in the Act of Parliament.

The CHAIRMAN: It ought to be in the Act. It is not a very difficult thing to draw, is it?

Mr. COOPER: It is not a difficult thing to draw, but it may be a

serious thing for the Company, because so long as it is merely an undertaking—so long as it is an undertaking given solely for the benefit of this particular petitioner—it can be altered by agreement between the two parties. But if you put it in the Act, it absolutely debars one from manufacturing for all time—long after this estate may be in other hands, or after it may have tumbled down.

Mr. RAPHAEL: If you put in "with the consent of the owner for the time being," that gets over the difficulty.

Mr. COOPER: Certainly. I did not understand that the Committee intended that there should be a statutory restriction on the use of the land.

The CHAIRMAN: It was your own proposal. What is the use of your saying in this room that you are prepared not to build manufacturing premises within a certain distance of Mr. Pitt's frontage if within two years' time you do it? There would then be no evidence that you had given the undertaking in this room, and Mr. Pitt's only remedy would be that it was a nuisance, and that you were damaging his property. You must draw a clause; but I think there is something in the point that you do not want to say that you shall never be at liberty to build there.

Mr. COOPER: If you refer to clause 4, you will see that we have a clause which sought to enable us to get out of the very difficulty you are seeking to put us in now with reference to the new site. There we endeavoured to relieve ourselves of the restriction put upon us by the Provisional Order of the Board of Trade in 1892. We were trying to get out of it by this Act.

The CHAIRMAN: I will adjourn this particular clause until to-morrow, so that you may see what Mr. Balfour Browne says.

Mr. COOPER: Would you be content if a clause were inserted giving protection to this particular petitioner—not a statutory restriction for all time?

The CHAIRMAN: We shall be contented with that. We have given our decision, and it really does not much matter what the petitioner says. He has to abide by it.

Mr. COOPER next pointed out that there was another matter which arose out of the clause inserted at the instance of the London County Council. In the terms as read out to the Chairman it ran: "Clause 5 (as to testing for calorific power, sulphur impurities, and illuminating power with flat-flame and incandescent burners) of the South Suburban Gas Act, 1906, to be inserted in the Bill, omitting (2) and (4) of the section." Mr. Cooper said that when they were at the consultation they did not realize what were portions of the Act specified. They had since considered the matter, and he understood that the London County Council would not object if sub-section 4 of the South Suburban Act were incorporated. He should like to have time to further consider this matter.

The CHAIRMAN said it would be dealt with, in conjunction with other matters, next day.

Wednesday, March 20.

On the re-assembling of the Committee this morning, the consideration of clause 29*a* was first taken.

Mr. COOPER proposed to add the words: "Section 7 ('Testing of Gas') of the Order of 1892 is hereby repealed as from the date when the new testing place and apparatus hereinbefore provided for shall come into use."

This was agreed to.

Mr. COOPER said he had consulted his clients in reference to the insertion of sub-section 4 of the South Suburban Gas Act of last session, and they had instructed him to put it in the Bill. As the London County Council had not raised any objection, he proposed to do this.

The CHAIRMAN agreed.

Mr. COOPER said the new clause was inserted as sub-clause 3: "The illuminating power as ascertained by means of a burner fitted with an incandescent mantle, such burner and mantle being of the best available pattern, and to be so used as to obtain from the gas the greatest amount of light." With regard to the other matter standing over, he had communication with Mr. Pitt's Solicitor, and they had agreed to the following clause: "Provided that the Company shall not construct any works for the manufacture of gas within a distance of 40 feet from the west side of Century Road, in the parish of Mitcham, without the consent in writing of George Pitt, the owner or reputed owner of the houses situate on the east side of Century Road aforesaid, or his heirs or assigns."

The CHAIRMAN having agreed to the insertion of this clause, the preamble of the Bill was read and agreed to; and the Bill, as amended, was ordered to be reported.

Salford and the Retailing of Coal and Coke.—A resolution has been carried in the Salford Town Council instructing the Gas Committee to consider the advisability or otherwise of retailing coal and coke, or either of them, direct to the residents of the borough.

Gas Tragedy at Reading.—Some days ago, a bailiff and his assistant, on entering a house at Reading through a window, found the occupants—a Mrs. Holdway and her son, for the apprehension of both of whom warrants had been issued—dead in a bedroom. Fixed to a gas-jet was a rubber tube from which gas had apparently been inhaled first by the mother and then by the son, as the pipe was hanging over the man's shoulder as if it had dropped from his mouth.

Increase in Price at Brentwood.—In moving the adoption of the report at the annual meeting of the Brentwood Gas Company, the Chairman (Mr. S. Ray) said the Directors felt that they were studying the interests of the Company by carrying forward a further amount of £234, rather than by giving an extra 1 per cent. dividend, which required £350. The ordinary consumers had increased from 752 to 850, and the prepaid meter consumers from 168 to 311; while 52 new cookers had been fixed, making the number in use 331. The Company's coal contract was expiring; and they had not had one offer less than 2s. 6d. per ton advance. They regretted to have to increase the price of gas by 2d. per 1000 cubic feet, bringing it to the price it stood at before the reduction last year—namely, 3s. 9d. The report was adopted; and a dividend of 8 per cent. was declared.

WORTHING GAS BILL.

House of Commons Committee.—Tuesday, March 19.

(*Before Mr.* A. HUTTON, *Chairman, Mr.* R. HUNT, *Mr.* AGNEW, *and Mr.* J. JOHNSON).

This was a Bill to authorize the Worthing Gas Company to acquire lands for manufacturing and storage purposes, to extend the limits of supply, and to consolidate and convert existing, and raise further, capital.

Mr. HONORATUS LLOYD, K.C., Mr. TALBOT, K.C., and Mr. BERNARD WILKINSON appeared for the promoters. The petitioners in opposition were Lieutenant-Colonel W. G. Margesson and others, who were represented by Mr. RAM, K.C., and the East Preston Rural District Council, who were represented by the Hon. J. D. FITZGERALD, K.C., and Mr. A. F. BART.

Mr. HONORATUS LLOYD, in opening, said the objects of the Bill were—(1) To authorize the Company to acquire by agreement certain lands, and to sanction the use of these lands for the manufacture and storage of gas; (2) to extend the limits of supply; (3) to authorize the consolidation and conversion of existing capital; and (4), to authorize the raising of additional capital. The Company was formed in 1835, and became a statutory concern in 1868, when the capital was fixed at £25,000; £12,250 of this being stock bearing a 10 per cent. maximum dividend and £12,750 share capital bearing a 7 per cent. maximum dividend. In addition to this, they were authorized to borrow £8000. In 1875, the Company extended their limits, and increased their share capital by £25,000, and their borrowing powers by £6250. The maximum price at that time was 6s. 6d. per 1000 cubic feet. In 1894, the Company being unable to obtain any land adjoining the existing site to extend their works, they found another site at Ham Field. Here they took a course which proved to be very unwise; for, in order to conceal the fact that the Company were the intending purchasers, they bought the land without making any trial borings whatever to determine the suitability of the subsoil. They subsequently obtained power to raise £32,000 of additional capital, and were granted £8000 further borrowing powers; and for the first time they were turned into a sliding-scale Company, with a standard price of 4s. 3d. per 1000 cubic feet and a neutral zone from 4s. 3d. to 3s. 9d. These prices were to be reduced by 3d. on the abolition of the local coal-dues. They were subsequently abolished; so that the standard price was now 4s., and the actual price charged at present was 3s. 6d. On setting to work on the Ham Field site when the gas consumption had greatly increased in 1895, the Company found that the subsoil was sand and running water, and that, in order to use it for their purposes, they would have had to go to a most unreasonable expenditure in piling, &c. They therefore at a later time sold the site (which had cost £2350) at a loss of £1050. In 1904, they increased their authorized capital by £32,000, and their borrowing powers by £10,660. Since then an immense increase had taken place in the demand for gas; and the Company found a fresh site in the parish of Goring, outside the borough boundaries. They had entered into an agreement with the owners to purchase the land (the area of which was 18 acres) provisionally upon the Bill passing. They wished to erect a holder on the site at once. As to extension of their limits of supply, they desired to include the parishes of Goring and Durrington, which would be conveniently served from the proposed holder. Regarding the third object of the Bill, the Company proposed to convert their 10 per cent. stock and 7 per cent. shares into 5 per cent. shares, by allotting £200 of 5 per cent. capital to every holder of £100 of 10 per cent. stock, and £14 of 5 per cent. capital to every holder of £10 of 7 per cent. shares. To this alteration, and to the fourth main proposal of the Bill, there was no opposition. They asked for power to raise £100,000 of additional share capital, with the usual one-third borrowing powers. Their total authorized capital at present was £114,000, and their total borrowing powers £32,916. There was £38,470 share capital and loan unissued, which by the Bill they proposed to repeal, excepting in respect of £7000 to enable the Company to go on with their development till the conversion took place.

Mr. *H. H. Gardner*, the Chairman of the Company, was examined in detail. In respect of the new gasholder proposed to be built on the Goring site, he said they intended to connect it with their works in the town of Worthing by a high-pressure main.

Mr. *W. A. Walker*, the Engineer and Manager of the Company, stated that the maximum daily output was 700,000 cubic feet; but the storage capacity was only 520,000 feet. A new holder was, therefore, imperatively necessary.

Mr. *C. L. Morgan*, the Chief Engineer of the London, Brighton, and South Coast Railway, gave evidence to the effect that the proposed site was an excellent one.

Mr. *Charles Hunt* said the proposed site, which he had carefully examined, was a piece of agricultural land surrounded by agricultural land. Four holes had been dug there; and he formed the opinion that the site was thoroughly suitable for the construction of gas-works. Water was met with on an average 16 feet from the surface. This was a very favourable fact. Many parts of a gas-works had to be laid underground. It was not necessary to lay these portions wholly underground; but all the mains had to be underground, and it was necessary that they should rest in dry soil. Regenerative furnaces were laid underground, so that the retorts might be worked from level ground. He had had experience of attempting to construct gas-works in water-logged ground. At Birmingham, when constructing two large tanks, running sand and water were encountered, with the result that all operations had to be suspended for twelve months to enable the contractor to provide additional pumping arrangements; the result being that the cost of the two tanks exceeded the estimate by 30 per cent. The construction of a small gas-works in Ireland on water-logged ground necessitated the raising of the whole surface of the ground by 7 or 8 feet; the addition to the cost of the works being fully 20 per cent. Therefore, if it was possible to obtain a site free from water, there was no sense in using one that was water-logged. The result of laying mains in water-logged soil would be that one could not alter or extend them without draining a very considerable area, which would be almost

impracticable, besides which there would be great difficulty in keeping them free from water. There was always the risk of leakage; and if water got into the pipes, it would stop the operation of the works. He had seen a section of the borings of the Ham Field site, which showed that water was met with there at an average depth of 18 inches from the surface. If this were correct, it would not be rational to place gas-works in such an area, if another site could be obtained.

In cross-examination by Mr. FITZGERALD, witness admitted that in works of moderate size, like these Worthing works, the furnaces were frequently above ground. But this added to the cost; they had to make the building higher. The choice of sites was limited, because they had to keep near a railway, otherwise the cartage of coal between railway and works cost 8d. a ton. This represented less than 1d. per 1000 cubic feet on the price of gas; but one would not deliberately select a new site away from the railway. He was aware that the Birmingham Corporation proposed two or three years ago to go outside their own borough, and set up works in an adjoining district. It was also true that they were already supplying gas in the district, and the Local Board of the district objected to it. Parliament refused to sanction the proposal; but they did not give as their reason that Birmingham must keep its nuisance to itself.

In re-examination by Mr. HONORATUS LLOYD, as to the Birmingham precedent, witness said the district to which Birmingham proposed to go was the urban district of Erdington, a populous district with 18,000 or 19,000 people; so that it did not compare in any way with the site which had been chosen here. He had never in his experience seen a site which was freer from inhabitants than this one. As to the question of a railway, certainly nobody in modern days would recommend the setting up of a gas-works away from a railway, if there was a site available adjoining a railway.

Sir *George Livesey* said he had seen many sites for gas-works, but none more unobjectionable than that which the Company had chosen. The Ham Field site, on the other hand, would be the very last one that he would choose. He had seen the house of Mr. Schweder, who opposed the Bill, and he did not think the proposed gasholder would be the slightest inconvenience to this gentleman. Gas-works had a bad name. This was due, he thought, to lime purification. Parliament had recently, however, relaxed the obligation to use lime.

In cross-examination by Mr. FITZGERALD, with a view of establishing that a water-logged foundation was not an insuperable objection, witness admitted that at East Greenwich, where all the extensions of his Company were going on, there was a bed of peat, and at a depth of about 15 feet they came to ballast.

Mr. *Duke*, a well-borer, being called to give evidence about the nature of the subsoil at Ham Field,

The CHAIRMAN suggested that there had been enough evidence on this point.

Wednesday, March 20.

Mr. *Joseph Cash*, referring to high-pressure mains, which is the form of main proposed to be used for conveying the gas between the present works and the new gasholder, said he had had special experience with regard to these high-pressure mains. He would put turbines with fans on to the existing works, and drive the gas through the main at a considerable pressure. He thought that through a 6-inch steel pipe 22,000 to 25,000 cubic feet of gas per hour could easily be transmitted. As to cost, his view was that the high-pressure main and the distributing main would cost £4500; and adding to this the cost of the machinery to produce the pressure, £500, the total cost under this head would then be £5000.

In cross-examination by Mr. FITZGERALD, witness was asked if he remembered the time when the east end of Brighton was a good residential part of the town, to which he assented. Counsel then asked him if gas-works were authorized just beyond this fashionable quarter, and if from that time onward there was no extension beyond the gas-works. Witness replied that there was no extension beyond on the way to Rottingdean.

Mr. FITZGERALD: From that time Brighton never extended in that direction?

Witness: There was no need for extension at that point.

You have merely a gasholder station there now?—But perhaps you will allow me to remark that at Hove, which is on the extreme boundary of Brighton, we had, up to a recent period, our works there. Why did they extend so much to the west when there was a gas-works there?

But since you have removed your works from there to Shoreham Harbour, the increase in Hove has been almost phenomenal, has it not?—There has been a very large increase.

Mr. TALBOT re-examined witness in reference to the gas-works at Shoreham Harbour, and he stated that a great deal of building had taken place around the gas-works; so that his experience entirely negatived the view that the presence of gas-works prevented building development.

Mr. *William Cash* was called to rebut certain aspersions cast locally upon the liquidation and assets of the Company, which he said were groundless.

This closed the case for the promoters.

Mr. *Fitzroy Somerset*, of Castle Goring, was the first witness called by Mr. FITZGERALD in opposition. He said some of his property was in the parish of Goring, where the new gasholder was proposed to be placed. His own residence was a mile-and-a-half from the proposed site. His personal objection to the proposed gasholder was that it would cut his line of view to the sea; his other objection was that it would spoil a model rural parish. Both the Parish Council and the District Council opposed the Bill.

In cross-examination, witness admitted that the Rural District Council, though opposing, would not risk their own money on the opposition, and the expense, in fact, was borne by the landowners of Goring, including a Mr. Schweder, who had been very active, as he lived nearest the proposed site.

The Rev. *G. Leefe*, Vicar of the parish of Goring, and Chairman of the Parish Council, said he thought few of the inhabitants would require the gas; most of them being cottagers. The people were, generally speaking, opposed to having gas-works there.

In cross-examination, witness admitted that there was little building development going on in the parish. He had known 14 houses to be erected in six years.

Dr. *J. E. Molson*, the tenant of Goring Hall, said he thought if the gas-works were set down in Goring they would be detrimental to it as a nice rural village. If they were built, he should determine his lease of Goring Hall. Opinion in the village was decidedly against the scheme.

Mr. *W. F. H. Lyon*, the owner of 1200 acres in the parish of Goring, expressed the opinion that the presence of gas-works would entirely alter its character. He considered that within a radius of 500 yards of the gas-works the land would be depreciated 50 per cent. in value; and beyond that, to the extent of half-a-mile radius, it would be depreciated 25 per cent. If West Worthing extended on to his property, the value of the land would go up; if the gas-works stopped that extension, it would go down.

Mr. *C. B. Cook*, an estate agent and surveyor, of Worthing, said that Worthing was developing on the west—the side abutting on Goring. The new property was of a good class, rents ranging from £70 to £150. The erection of the gasholder would seriously hinder the development of the building land. He thought there would be no difficulty in getting a site for gas-works at the east, or north-east end of the town. At the east end there was already the refuse destructor, the sewage tanks, and the slaughter-houses; and that seemed to be the proper place to put down another "nuisance," if they had one.

Mr. *E. H. Stevenson*, while agreeing that the new gasholder was required, said the manufacturing plant was equal to considerably more than the present demand. He understood that the promoters proposed to use this new site for the new holder, and to retain the manufacturing works for a period which they had not stated on the present site in Worthing; the two being connected by a main. Personally, he would have advised the Company to contract for a larger gasholder than was mentioned by Mr. Cash, who put it at 500,000 cubic feet. Mr. Cash suggested that a 6-inch steel main should be laid down to supply 500,000 cubic feet a day at considerable pressure; but a steel main would be absolutely useless when the works were shifted. Therefore he did not think it was economy on the part of the Company to connect up any two stations, as was proposed, with a steel main; it should be a cast-iron main of such a size that in future it would supply gas to the town. A return main from the proposed gasholder would also be necessary, because the gasholder must be connected up to the mains of distribution, and it would be most unwise to use a single pipe for this purpose. As to using the very small pipes which were laid in West Worthing at present, far from the works, this would be a great mistake. At present the gas flowed to the westward. The big mains, therefore, were in the east; and whatever gasholder they had, whether it was placed to the west or whether it was placed to the east, the return main ought to come back to the existing works, or else the whole of the arterial pipes (not the smaller ones) throughout Worthing should be altered so as to bring the larger ones to the west end. The cost of taking the return main from the site at Goring to the old works would not be less than £6000 or £7000, because it must be larger than the pipe leading from the old works to the new, as the gas had to be supplied at a much less pressure—only the pressure of the gasholder. Thus the total expense (adding £4000 or £4500 to connect the two stations) would be £10,000 or £11,000. If, on the other hand, the new site were at the east end of the town, a great deal of this would be saved; the mains would be shorter. The general interest of Worthing would suggest the east end. In his opinion, it was a very great mistake to tie up Worthing between the existing nuisances to the east, and another one to the west. The market for their coke was also at the east end, where there were many glasshouses. There would be no difficulty in erecting the proposed works on some of the vacant sites to the east. It was not necessary to be on the main line of railway. There was no reason why the Company should not go, as Eastbourne did, about a mile from the town into the country at the back. As to the proposal to include Goring within the limits of supply, it would be many years before gas would be wanted there. In his knowledge it had never been the practice of Parliament to force gas-works on an unwilling district, nor to force an unwilling district within the area of supply. Both at Tunbridge Wells and at Birmingham they sought to go outside the area in a somewhat similar way; and Parliament declined to allow them.

In cross-examination by Mr. HONORATUS LLOYD, witness said he was in Worthing about 24 hours on this matter. He admitted that he did not meet the Clerk to the Rural District Council or any other official. As to the subsoil at Goring, it was as satisfactory as most of the soil in that district.

Mr. HONORATUS LLOYD: Do you mean to suggest that the subsoil of this site is anything like that at the east end?

Witness: In some parts of the east it is quite as good as it is here, in my opinion.

Did you suggest to your Council to propose a site to the east which we might test?—We cannot go on alternative sites in these rooms, as you know. Therefore we could not propose an alternative site.

Have you any reason to believe that there is an inch of land there that we can get by agreement?—I do not doubt it for a moment.

Witness added that he would guarantee he could buy almost any quantity of land up there. If a site was procured by agreement, they would then have to acquire land for a siding. He knew that Parliament had granted compulsory powers for sidings to gas-works. They did it at South Shields. He admitted that in that case the gas-works had been in existence for years close to the railway, and all negotiations had failed to enable the siding to be made between the railway and the works. He believed that was the only case in which compulsory powers for acquiring land for sidings had been asked.

Witness was also cross-examined as to the Tunbridge Wells precedent he referred to.

Mr. HONORATUS LLOYD: Do not you know that the Corporation of Worthing assent to this proposal?

Witness: Yes; but the Tunbridge Wells Corporation objected.

Do you cite that as a precedent?—Certainly, because the Local Authority of this district object. It is exactly on a par, only it is stronger in this case, because here you are including the district in your limits of supply, for the purpose of putting works there.

You know that if Parliament authorizes us to use this site we are not excused from the nuisance sections in the Acts of 1847 and 1871?—No; but, unfortunately, works cannot be carried on without a nuisance.

Mr. *Joseph Cash* was recalled, at the request of the Committee, in reference to alternative sites. He said he had examined the whole of the line of railway in the borough of Worthing with a view to finding a site. It was absolutely necessary to have a site which had a siding attached to the railway. He could find no such site where the soil was suitable. He had made excavations at Little Chesswood Farm (opposite the Ham Field site) and on two sites at West Worthing, and all revealed running sand in the subsoil. He had overlooked no other site; there was none which he could select and ask for power to inspect.

In cross-examination by Mr. FITZGERALD, witness said he confined his general examination to the land along the line of railway.

Mr. FITZGERALD then addressed the Committee, contending that everything pointed to the east end as the right place for erecting these works, and that to put them in the west was to sacrifice Goring, though in that place the proposal was unanimously opposed.

Mr. *Thomas Bushby*, of West Preston Manor, an old inhabitant of Worthing, examined by Mr. RAM, expressed his opinion that the erection of the proposed works in Goring would greatly deteriorate the value of property there.

Thursday, March 21.

When the Committee met to-day,

Mr. *C. B. Cook* was recalled by Mr. RAM, and pointed out a site at the east end of Worthing close to a point where a well was sunk. The strata through which this well passed was chalk. That was 300 or 400 yards from the railway.

In cross-examination, witness, having in his examination-in-chief pointed out another site with a good subsoil of clay, admitted that he did not know whether the owners of either of these properties would be willing to sell. One of the sites he had referred to was outside the borough boundaries.

Answering the CHAIRMAN, with reference to the site where he had seen a well bored, witness said the chalk and marl went down, to his knowledge, 30 feet; and he considered this a suitable foundation. Of course, they would have to sink trial holes to make sure. He did not know whether this land was in the market, however.

Major *Margesson*, son of Lieutenant-Colonel Margesson, one of the petitioners, said there were negotiations as to the sale of some of his father's land as a site for these works; but after conferring with Mr. Bushby, who energetically dissuaded them, they broke them off.

Mr. RAM then addressed the Committee briefly.

The CHAIRMAN afterwards asked Mr. Honoratus Lloyd in his reply to address himself to the question of an alternative site, which was the chief point left for the Committee to consider. While they might not accept all the opposition had said about the nuisance, still he did not suppose the Committee would, without good reason, pass a Bill which went into the district of another authority who were opposing.

Mr. HONORATUS LLOYD, in addressing the Committee, urged that the promoters had examined all the available sites, but in vain. It was, in fact, against their own interests that they were driven to go out to the distant parish of Goring, because, as Mr. Stevenson had put it to the Committee, this would entail an outlay of some £10,000 or £11,000 in mains.

Friday, March 22.

On the resumption of the proceedings to-day,

The CHAIRMAN stated that he had communicated with the Board of Trade on one or two points, and he had a promise of an answer on Monday afternoon; so that he thought it would be perhaps best to give the Committee's decision on Tuesday morning.

Allegations of Negligence at Pontypool.

The allegations of negligence made against the Pontypool Gas and Water Company formed the subject-matter of comment at the recent annual meeting of the Company. The Chairman (Mr. A. A. Williams) said a point of great importance was the action of the Joint Committee of the Local District Councils, who had been pressing the Directors to enter into negotiations for the sale of the undertaking. The Directors had carefully considered the matter, and had come to the conclusion that it would be unwise to sell. He, however, regretted to inform them that the Pontypool and Panteg District Councils had commenced an action against them for damages, mainly arising, as they alleged, through negligence on the part of the Company in regard to the recent epidemic of typhoid fever. Acting under the advice of eminent Counsel, the Company were taking steps to defend the action. Subsequently, the meeting approved of the action of the Board in taking steps to secure an increased number of springs. Mr. M. A. Bythway, Solicitor to the Company, said the Directors had for some time past been taking steps to materially increase the supply of water. He hoped they would be able to put an end to the complaints of shortage that had been continual for the last few years. They had increased the storage accommodation at the reservoirs from 6 to 13 million gallons. The allegations of negligence on the part of the Directors, and the statements of the public that they were wasting money in paying high dividends, were not justified.

Profits and the Rates at West Bromwich.—The West Bromwich Gas Committee, in a special report, recommend that, in order to avoid an excessive increase of the rates, consequent on the heavier burden of the cost of education, a minute of the Council relating to the apportionment of gas profits in aid of rates be suspended for this year, to enable them to contribute out of the profits of the current twelve months £1000 in relief of the general district rate for the ensuing year. The Electric Lighting and Power Committee also recommend that £800 be granted from the profits of their undertaking in relief of the general district rate.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, March 11.

(*Before Justices* DARLING *and* A. T. LAWRENCE.)

Earl of Carlisle v. Carlisle Corporation.

This was a motion on behalf of the Corporation of Carlisle to send back to the Umpire, in order that he might state a special case, an award which he had made in favour of the Earl of Carlisle, on a claim put forward by him against the Corporation in respect of certain land taken by them for the purpose of their water supply.

Mr. BALFOUR BROWNE, K.C., Mr. E. PAGE, K.C., and Mr. J. T. WOOD appeared for the Corporation; the Hon. J. D. FITZGERALD, K.C., Mr. ACLAND, K.C., and Mr. DU CANE represented the Earl of Carlisle.

Mr. BALFOUR BROWNE opened the case, and his argument occupied a great part of the day; but the real points in controversy may be shortly summarized. The Corporation of Carlisle in 1898 obtained an Act of Parliament for bringing water from certain springs in the Geltsdale valley; the greater part of which was Lord Carlisle's property; conveying it by means of a pipe to a reservoir (not on his Lordship's land), whence it was to flow on to the city. They gave notice to treat for certain small portions of land surrounding the springs in question; and the compensation to be paid was referred to the arbitration of Messrs. Heskett and Fenwick—Mr. John Farrer being appointed Umpire. The arbitration occupied five days; the claim sent in being for £32,000, and being supported by witnesses, who included in their valuation of the compensation payable a sum of £22,888, calculated on the basis of 25 years' purchase of £885 2s. 6d., which was the value per annum of the water. The figures put in by the Corporation included nothing under this head; and Counsel contended that nothing could legally be awarded under it. Nevertheless, the sum awarded—£17,261—must, he said, have included about £8000 for the water, as such a sum remained after allowing for all the other items in full. In the course of the proceedings, he asked the Umpire to make his award in the form of a special case, so that the legal point could be argued. It was expected by everybody that this course would be followed; but after waiting three months the Umpire published his award for a lump sum for compensation for the land taken and for damage to the estate generally.* This was the main point. But there were two subsidiary matters in which Counsel suggested that the Umpire had probably estimated the damage on the wrong basis, though he could not be certain about it, until the case was stated.

Mr. FITZGERALD argued at considerable length that the award ought not to be sent back, and that, though his witnesses had reckoned the damage on the basis of so many thousand gallons of water at a certain price, he had made it quite plain in his speech that he did not claim for the sale of water, but for damage to property; the figures being given only as a basis of calculation. His contention was that the property, from its position, elevation, and surroundings, was very valuable as a water-bearing property, which other municipalities might be willing to acquire in its entirety as a means of obtaining a supply, especially as there were upon it natural reservoirs, as he might term them, which would save a great deal of expense in the construction of works. But such a sale was entirely prevented by the Corporation's Act; because it was not to be supposed that Parliament would grant any other public body the right to take water which was already allotted to Carlisle.

Mr. ACLAND urged that, under the circumstances, the Court had no power to send the award back.

Justice DARLING, in giving judgment, said that on the two minor points—the approach to the stream and the sheep-washing place—there was no ground for sending the award back; but on the other and more important point, as to the principle on which the compensation was awarded to Lord Carlisle for the injury done to his property, he thought it should go back. There was sufficient ground made out for coming to the conclusion that the Umpire should have stated a special case. Early in the proceedings, Mr. Balfour Browne stated his objection to the mode of assessing the compensation which was being put forward by those representing Lord Carlisle. One of the witnesses put it as "water taken, average daily yield, so many gallons, at ¼d. per 1000 gallons, £2 8s. 6d. per day." This was multiplied by 365, to give the year's value, and then by 25 years' purchase; and Mr. Browne asked the Umpire, if he decided against his contention, to put his award in the form of a special case, so that it could be tested in Court. What he put forward then, as he did now, was that, instead of considering generally what was the damage to the property, a claim was put forward which depended on the quantity of water taken, just as if it were a commodity which Lord Carlisle was selling to the Corporation. In his final speech, he again alluded to it; and it appeared to him that the arbitration concluded with the expectation by the Corporation that a special case would be stated. Further, the evidence offered by the claimant's Counsel plainly asked the Umpire to award compensation on the wrong basis. It asked him to compute the damage done to the property precisely as though the coal were being taken out from under his land, and this not only in dealing with the springs which the Corporation had a right to take, but with running water on the land which they they did not take at all. It was said that he had there a large piece of land the whole of which he might have sold to some other corporation, because there was water on it; but the Corporation of Carlisle had taken some of it, which diminished the supply, and so he was entitled to go into a calculation and show that he had lost all, because he could not sell to anyone else what the Corporation had not taken. Mr. Fitzgerald, seeing how fallacious that was, tried to get out of it by calling it "compensation for injury." But it did not make it any better by saying: "I put it as though we were selling the water at so much per 1000 gallons; but I know that would be wrong,

* See "JOURNAL," Vol. XCIII. p. 749; and Vol. XCIV., p. 716.

so I do not call it the price of water, but compensation." The proper way would have been to have stated how the compensation was arrived at; and therefore the Umpire should state exactly what he had done in the form of a special case.

Justice LAWRENCE gave a short judgment to the same effect.

The costs of the application were reserved.

We learn that Lord Carlisle's Solicitors (Messrs. Bircham and Co.) have given the Town Clerk of Carlisle (Mr. A. H. Collingwood) notice of his attention to appeal against the decision above recorded.

EDGWARE PETTY SESSIONS.—Wednesday, March 20.

(*Before Mr.* J. E. LILLEY, *Chairman, Mr.* ACTON DAVIS, *and Mr.* C. R. NUGENT.)

The North Middlesex Gas Company Prosecuted for Alleged Deficiency in Illuminating Power.

To-day the North Middlesex Gas Company were summoned, at the instance of the Hendon Urban District Council, by Arthur William Mitchell, the Gas Examiner to the Council, for having, on Aug. 31, Sept. 26, Oct. 25, Nov. 7, and Dec. 3 and 17, 1906, and the 17th of January last, supplied to the testing-station, at the offices of the Council, gas of less illuminating power than 15 candles, contrary to the provisions of the Gas-Works Clauses Act, 1871, and the North Middlesex Gas Acts, 1895 and 1903.

Mr. COLQUHOUN DILL (instructed by Mr. E. Bevir) appeared for the Council; Mr. R. S. CLEASE (instructed by Messrs. Merrimans and Thirlby) represented the Company. Professor Vivian B. Lewes, Dr. Harold G. Colman, and Mr. G. C. Trewby were in attendance to give evidence on behalf of the Company.

Mr. DILL, in opening the case, said the Company's Act of 1903 contained a clause requiring the District Council to provide a testing-place and the necessary apparatus and machinery for testing gas, but previously it had been an obligation on the Company to maintain a testing-station to which the officers of the Council had access during the tests. Counsel then handed in voluminous correspondence which had passed between the Council and the Company, beginning in 1904 and continuing until the present year; and he read one or two letters to enable the Court to better understand the history of the case. He said the correspondence showed that the Company put forward four contentions: First they said the Council's officer had been testing stale gas, because insufficient was allowed to burn before the test began. The Council's answer was that the gas had been allowed to burn from six to eight hours before it was tested; and the inference was that this was a more than sufficient time to consume all stale gas in the service-pipe, and that it more than complied with the Act of 1871 and the regulations prescribed by the Metropolitan Gas Referees. Moreover, the Council said the gas had been burning two whole days preceding the test made on Dec. 17. The second contention of the Company was that, owing to the low temperature in the testing-station, the tests were not reliable. The Council answered this suggestion in the same terms—viz., that prior to each test the gas was allowed to burn for some hours; and if there had been any defect or exceptionally low temperature it would have been set right by the aërorthometer, which corrected the actual temperature of the room. The third contention was that insufficient notice had been given to the Company's officer of the intention to test. The Council's reply was that notice had been given of all the tests, and that the Company's officer had been present at five out of the seven dates on which complaints were made. The fourth contention was that general access to the testing-station should be given to the Company's officer at all times, as provided for in the Gas-Works Clauses Act, 1871. The answer to this was that no such right of general access was provided by the subsequent Acts, but only a right to be present when tests were actually being made.

The CHAIRMAN suggested that, as the Company had the right of free access under the Act of 1871, the same right would exist under the Act of 1903.

Mr. CLEASE said both parties had free access under the old Act, and the same powers existed under the new one.

Mr. DILL contested this statement. Proceeding to further refer to the correspondence, he said the Company insisted in January, 1906, upon a gas-testing apparatus in conformity with the requirements of the Gas Referees being fixed, and the demand was complied with. Later there was a request from the Company that the Council would allow their Engineer and Chemist to have access to the testing-station at other times than during the official test, in order to investigate the cause of the discrepancy between the Council's and the Company's tests. The Company pointed out that the difference might be due to several causes, but they were quite inexplicable without a thorough test. On July 24, 1906, the Council wrote that, unless steps were taken by the Company to supply gas in accordance with the terms of the Act, proceedings would be instituted; and they also stated that the Council could not offer the Company further facilities for testing the gas at the station. The Company wrote in reply that the Directors repudiated in the most emphatic manner the suggestion that the Company had failed to supply gas of the required standard. Coming to the final stages of the negotiations, Counsel said the test made on Aug. 31 last showed the illuminating power to be at 6 p.m., 14·17 candles; at 6.20 p.m., 14·25 candles; and at 7.30 p.m., 15·44 candles.

Mr. CLEASE: Which proved conclusively that the examiner was testing stale gas.

The CHAIRMAN: There is another answer.

Mr. CLEASE said he was going to give all the reasons. This was conclusive evidence that as soon as the stale gas in the supply pipe was exhausted, and the gas was drawn direct from the main, a higher standard was attained.

Mr. DILL said this was not the construction put upon it by the other people. The Council had been long-suffering in the matter, and had given the Company the fullest warning; and now, after a long delay, they were compelled, in order to get an adequate light in accordance with the Act of Parliament, to proceed by summons. He asked the Court for a substantial, though not a vindictive, penalty.

Evidence was called in support of the summons.

Mr. *A. W. Mitchell* said he had been one of the Gas Examiners for the London County Council for sixteen years; and he received the appointment under the Hendon District Council on Oct. 24, 1904. He made the tests which formed the subject of the present proceedings. The exact candle power on the given dates was as follows: Aug. 31, 14·6; Sept. 26, 14·49; Oct. 25, 11·81; Nov. 11, 14·30; Dec. 3, 14·21; Dec. 17, 14·28; Jan. 17, 1907, 13·76. The usual time for making tests was between 6 and 8 p.m. The room was kept at a temperature varying between 55° and 65° Fahr. The tests were made in conformity with the regulations of the Gas Referees, and the apparatus was in conformity with their requirements. A representative from the Gas Company was present at all the tests up to the 25th of October. Witness usually gave the Company an hour's notice by telegraph of his intended test. Their representative did not at any time suggest that the test was being improperly made, that the apparatus was not in order, or that stale gas was being tested. The gas was lighted eight hours before he made any of the tests; and stale gas, in the length of pipe in this case, would have been consumed many times before he began. The London County Council's regulation prescribed 15 minutes for burning out stale gas. Prior to the test of the 17th of December, the gas was burning two days, and an unofficial test was made on the 15th and 16th. He occasionally found the gas exceeding the standard power.

In reply to questions put by the Bench, witness said the testing-room was heated by hot air, and was never below 55° Fahr. The place was ventilated by gratings in the wall, and the door opened into the main hall. If the air had been vitiated, he would have perceived it.

Cross-examined by Mr. CLEASE, witness said the door was very often open during the tests, some of which were made in the dark. The gas was burnt through the meter in order to clear the service-pipe of dead gas. The tests were made once a month; and in the meantime he knew nothing whatever about the meter or apparatus—he did not know whether or not it was meddled with. He believed the Council had since 1904 consumed 3300 cubic feet of gas in making the tests; and he was prepared to believe that the Company had consumed in the same period for the same purpose 72,200 cubic feet. The book produced contained a record of the result of his tests. He usually gave the Clerk to the Council a day's notice of his intention to test the gas, and the Company, who were vitally interested, an hour, or it might be half an-hour's, notice by telegraph. He had not received instructions to give the Company longer notice.

Mr. CLEASE: Why cannot you give the Company notice at the same time that you notify the Council?

Witness: I have a reason. If I gave 12 hours' notice, they might improve the gas, which they were quite capable of doing, and raise it above the standard. What then would be the good of my test?

Cross-examination continued: He did not know whether his notice had ever arrived too late in the evening to receive attention. He did not intend it to be too late, and he was sorry if it had ever been. He was not aware that the result of the Company's test on Aug. 31 was 16·04-candle power, whereas the Council's test was 14·6 candles.

Mr. CLEASE, after examining the record, pointed out that on the 31st of August the figures in the book did not agree with those already given before the Court, and said it was a most extraordinary thing that they had never been corrected.

Mr. DILL said the mean average was the same—14·6 candles.

In further cross-examination, witness said he did not agree figures with the Company's representative. He merely gave him the figures, and he entered them in a book; but whether or not this was done correctly he (witness) was quite unable to say. If his figures differed, the representative could not have entered them correctly. The testing-station was provided with a thermometer, but not with a barometer, though it was one of the regulations of the Gas Referees that they should keep both. He sometimes took the reading of the barometer out of the newspaper. (Laughter.) Witness was then taken through the various results of tests, and asked what he thought would happen to the gas-stoves and the light with an ordinary burner if the illuminating power was only 11·81 candles, as stated on the 25th of October. He said the light would be very bad, but he had not studied the question of gas-stoves. He did not know whether there would have been hundreds of complaints. People often complained to one another, but did not write to the gas company. He had never managed a gas company, and could not speak from knowledge. He was not aware whether the Council complained of the light on that particular night. They might have complained. Once he told the representative of the Company that the meter gave him a lot of trouble; but this was accounted for by the fact that at a particular spot a little water accumulated, which he always cleared away before making a test. He had not heard that the Company complained that the tests were intermittent, but he was aware that they thought the gas should be burnt continuously. He had not heard that the Company offered the gas free in order that the tests might be made real. Apart from clearing the pipe from stale gas, there was no other trouble. The fact of the apparatus remaining idle for two or three weeks might produce naphthalene under some circumstances. He could not say that the testing was wrong if it did not comply with all the requirements of the Gas Referees.

Mr. CLEASE: The Gas Referees require that the testings for illuminating power made with a standard argand burner shall be three in number daily, at intervals of not less than one hour.

Witness said he took that to mean three times on the day the test was made, but not a daily test.

Mr. CLEASE asked if one single test had been made in accordance with the regulations of the Gas Referees, and therefore whether there had been one reliable test.

Mr. DILL (interposing) said these regulations referred to the Gaslight and Coke Company and the other London Companies, but not to a place like Hendon.

Mr. CLEASE said the clauses were in the 1871 Act, and the Company had power to adopt them—in fact, did adopt them.

Mr. DILL said the point had not been raised in the correspondence. Nothing had been said about a daily test.

Mr. CLEASE replied that the fact that the Company had not found fault did not prevent them from raising the point before the Court.

The CHAIRMAN said the Bench were of opinion that the regulations affected the tests.

Mr. DILL said it would be wrong to argue that the 21st clause of the regulations of the Gas Referees applied to Hendon, because the latest Act did not say how the test should be carried out. To say it applied to Hendon was to say it applied to every district.

The CHAIRMAN thought that the regulations referred to must be applied to all Acts of Parliament relating to gas testing which incorporated them—that was to say, they could not be applied partially, but must be applied in their entirety.

Mr. DILL contended that the regulations were made for London, and were intended to apply to London and not outside.

The CHAIRMAN: It must have been in the minds of the Referees that they should apply to all.

Mr. DILL said that clause 21 applied to London. If this clause was incorporated in the Hendon Act, why not all the other regulations in force in London?

The CHAIRMAN asked if Mr. Clease wished to go on with the evidence, or whether it was probable the case might be taken to another Court.

Mr. CLEASE said they would take the case to the House of Lords if necessary. There was no appeal on the question of fact; and he could defeat the other side on fact, which he preferred to do. His clients would rather go on with the case.

After further examining the Act of 1905, the Magistrates stopped the case.

The CHAIRMAN asked whether, in face of their reading, they could go on. He added that Mr. Dill had fought the case as far as he could, and Mr. Clease had established to their satisfaction that it could not go any farther. The summons would therefore be dismissed.

Mr. CLEASE then raised the question of costs. He said it was a bad case. For two years the Company had pointed out that the test of the gas was not a proper test.

The CHAIRMAN said he was sure the Council had no intention of persecuting the Company. What costs were claimed?

Mr. CLEASE said he was advised that the Company's costs would exceed 100 guineas. The Company had intended to carry the case to the House of Lords, and therefore brought down from London experts such as Professor Lewes, Dr. Colman, and Mr. G. C. Trewby.

The CHAIRMAN said, on looking at the witnesses whose names had been mentioned, the sum was not large. He asked Mr. Clease if he would say 75 guineas.

Mr. CLEASE assented, and the costs were entered at this amount.

LAYING MAINS UNDER FOOTWAYS.

At the Edgware Petty Sessions last Wednesday, the Hendon District Council were summoned, at the instance of Mr. Lawrie Trewby, the Engineer and Manager of the North Middlesex Gas Company, under the following circumstances: A difference had arisen between the Council and the Company respecting a plan, according to which the soil and pavement of Finchley Lane were proposed to be taken up and a gas-main laid therein, and the Council had objected. The Company were therefore desirous that the matter should be determined by two Justices, as provided by the Gas-Works Clauses Act, 1847. Mr. Clease, who appeared in support of the summons, contended that the Council could not dictate to the Company. They could disapprove of a plan and suggest an alternative; but this was not the attitude that they had taken up, as evidenced by their letters. Counsel put in a plan showing the position of the proposed main under the footway; and, after commenting on the correspondence, he argued that no reason had been stated by the Council as to why objection should be raised to the Company placing the pipe as shown. He called Mr. Trewby, who said the path in Finchley Lane at the point indicated was 11 ft. 6 in. wide; and if they carried the main down the highway, the path would have to be opened up in the case of each house. It was the policy of gas companies to lay their mains under the footways. In cross examination by Mr. Colquhoun Dill, who appeared for the Council, witness said the cost of laying the main in the road would be higher than if it were laid under the footpath; and the consumers would pay for it. He was of opinion that it was easier to reinstate an asphalte path than a road trench, if the paving was properly laid. Once laid, it was rarely, or never, opened for repair; but when a main was laid under the highway, they were constantly opening the road to effect repairs. The Chairman (Mr. J. E. Lilley) said the Bench were of opinion that the Local Authority had control of the highway, and that the Justices would not interfere in the matter unless they were withholding some power for a fanciful reason. If this observation would help the present parties to come to an agreement, he threw it out. Mr. Clease said he would show that the Gas Company's views were not fanciful. He then called Mr. J. Anthony, their main-laying foreman, who said his 18 years' experience was that the leakages caused by vibration and settlements when mains were laid in roads were a source of great expense. In the present case, there was an element of great danger in the electric cable. Mr. S. S. Grimley, the Engineer to the Council (in answer to the Chairman), said they considered that in certain cases, especially as in this one, where there was only one footway in the road, it would be far less inconvenient to the general public if the mains were laid under the carriage way. The Council generally objected to mains being laid under the footways. The Chairman said the Council were the rightful custodians of the roads, and unless it was shown that they were acting unreasonably in their requirements, they ought to be supported in their action. The Court, in this instance, did not think they were acting unreasonably; and therefore they sustained them in their decision. Mr. Dill asked for costs; but Mr. Clease objected, on the ground that the Company merely came to the Court to assert a right. The Chairman said the Bench were of opinion that the parties should pay their own costs.

MISCELLANEOUS NEWS.

NOTTINGHAM GAS INQUIRY.

The Fourth and Fifth Days' Proceedings.

The Committee of the Nottingham City Council appointed to inquire into the working of the gas undertaking during the past five years, sat on Tuesday and Thursday last week. The members of the Committee are: The Mayor (Alderman J. A. H. Green), Mr. E. L. Manning, Mr. S. Cook, Mr. E. N. Elborne, and Dr. Dabell.

The MAYOR, at the opening of the proceedings, said he had received a letter which suggested that he acted as Mr. Harlow's legal adviser up to and during the proceedings of the late Investigation Committee; and that, therefore, he ought not to take a leading part in this inquiry. He explained, however, that he had not in any matter been Mr. Harlow's legal adviser; but that one day he was asked (he did not know by whom) if he would go and meet Messrs. Harlow, Sands, and Jelley in the Town Clerk's room. On arriving there he learned that the Town Clerk had written to each of these gentlemen asking if they would consent to his giving a copy of a statement made by Mr. Brown to each of the others, though the statement might contain reflections on themselves. He (the Mayor) was asked his opinion as to the course that should be taken. With the consent of the three gentlemen, the Town Clerk showed him what Mr. Brown had said about them. He suggested that Messrs. Jelley and Sands might very well authorize Sir Samuel to give Mr. Harlow three copies with which he could do as he pleased. This would get over any question there might be of publishing any libellous matter. The suggestion was acted on. He supposed his opinion was asked as one who was detached from the quarrel.

The other members of the Committee having expressed confidence in the Mayor, and Mr. Brown having acknowledged the kindness and consideration he had shown towards him, copies were put in by the latter of tables showing the amount spent out of revenue on repairs during the last five years and the capital outlay, and the candle powers and the complaints per 1000 meters during the same period.

Mr. *J. H. Brown*, the Engineer, was then asked how the plant at Eastcroft had been manipulated during the later months of 1905, in connection with the irregularities referred to at the previous sitting. He replied that the seals had been lowered in the retort-house, and the exhausters had been run at a higher rate than was reasonable, producing a greater quantity of gas per ton than would yield a satisfactory candle power. Lessening the seals would not necessarily admit air into the retorts; but it would lead to the introduction of furnace gases in some cases. A higher candle power than was actually being made had been entered on the records at the works. During the months of September, October, and November, 1905, some 2000 more complaints were received than in the corresponding months of the previous year; whereas for the whole of the year the increase was only 1300. Instructions at the works would be received from the works foreman, whose subordinates would not accept responsibility for what they were doing. Suction could not now be increased beyond the amount controlled by the automatic apparatus. The gentleman who made the statement to him about what took place at Eastcroft, had occupied the position of Assistant Engineer at a London Suburban gas-works before he came to Nottingham on witness's recommendation. Witness had full confidence in him before this discovery was made. He left a few months afterwards. He could not say for the moment whether he had a testimonial when he left. He did not think he had one from the Committee. Until Dec. 9, witness had no knowledge whatever of this falsifying of the records or tampering with the plant. It was criminal folly on the part of any gas engineer to have done anything of the kind. They commenced to put blue water gas into the mains some time in 1903, and continued to December, 1905—only from the Basford works. The biggest proportion in any one day was 8·06 per cent., some time in July, 1905. Complaints were low during that period. They never made carburetted water gas in sufficient quantities to register.

By Mr. COOK; Water gas could not possibly have had anything to do with the complaints. During the two years they were using water gas, complaints were low. The blue water gas would most certainly mix properly with coal gas, because it contained practically the same constituents as coal gas, only in different proportions. It was impossible for even a chemist to detect the presence of a small proportion of blue water gas.

The MAYOR read an extract of a report by Mr. Harlow, in which he said that, in a conversation he had had with Sir George Livesey, he told him (Mr. Harlow) that it was most difficult to mix blue water gas with coal gas. It was like mixing oil with water. The blue water gas would float about the mains in patches.

Witness said he had never heard of such a suggestion from any other source; and he referred to undertakings where as much as 50 per cent. of water gas was introduced into the mains, without any serious complaint. Nottingham, he said, was doing nothing very extraordinary in adopting blue water gas.

Dr. DABELL said he would like to definitely ascertain the reason for the Engineer's advocacy of the carburetted water-gas plant.

Witness replied that it arose from the question of storage. The water-gas plant actually took the place of a holder; and the first cost of the water-gas plant was less than the first year's interest on the amount required for the erection of a gasholder of sufficient size. The plant was also of great use in case of a sudden demand when there was fog. He would not recommend carburetted water gas as economical for regular production, but only in special cases. The effect of blue water gas used in excess was to reduce the illuminating power of the gas. Blue water gas, however, might be used up to the proportion of 30 per cent. without materially affecting the light. Where it was used in great quantity, it was possible to increase the illuminating power of the gas by having a benzolizing plant on the site. The greater cheapness of blue water gas would more than pay the consumer for laying down the benzolizing plant. The amount of blue

water gas used in Nottingham, however, could not possibly have decreased the illuminating power of the gas or given rise to any complaints of the indifferent lighting of lace factories.

Witness next went on to speak of the complaints received during the fatal December. On investigation of the complaints, he said, it was found that they appeared to be localized—that the troubles occurred in "patches." One day four or five complaints would be received from the Meadows, another day from as far away as Bulwell. The gas sent out at one time, it was concluded, would go to one place; and the complaints were generally as to the quality of the gas in the morning. Further inquiries led to the eventual discovery of the fault at Eastcroft. A system of tabulating the complaints was introduced in March of last year; and of those received, 12,600 were to be traced to the Corporation, while 3500 were to be traced to the consumers. Complaints were also made of lamps being out in the morning—this being due either to the fluctuation of quality or to the pressure, which at midnight was very greatly reduced. Complaints were still received; but when the number was compared with that of other towns, the comparison (despite the difficulties which the varying altitudes of the city presented) was not at all unfavourable to Nottingham. As regards the present method of dealing with complaints, he was not contented, principally because the clerk who received them had not the technical knowledge necessary to question the consumer. At the time so many complaints were being made, witness recommended certain proposals for dealing with them; but the recommendations were not prepared at the request of the Gas Committee. He personally investigated the complaints; and feeling that the matter was not being satisfactorily dealt with, he prepared the recommendations, in the hope that the Committee would discuss the question. The recommendations were not, however, acted upon.

The MAYOR: I suppose the Committee were at their wits' end to know what to do.

Witness: Yes.

Mr. MANNING remarked that, though the matter was of such importance, the recommendations were not considered by the Committee.

The MAYOR: They were in too great a panic to consider anything in cold blood. Continuing, he said they were all conscious of a great outcry; and he asked witness if he could give a reason for this.

Witness replied that it would be difficult to summarize the cause. In every undertaking of the description of the gas-works, there were panics at one time or other; and it was almost invariably soon after the notification had been made of a reduction of candle power. The matter, to his mind, was brought to a head by the statement in June, when a deputation of the Chamber of Commerce were before the Gas Committee; and they were told that the candle power was reduced, and that a further reduction, rather than an increase, was likely to take place. After that all complaints, from whatever cause, were put down by the public to bad gas. There were many complaints quite justified—caused by the irregular pressure of the gas interfering with the working of meters, by the presence of naphthalene, and by the bad gas produced at Eastcroft.

The MAYOR: Do you think that the sudden reduction of the candle power had anything to do with the complaints?

Witness: Yes; where there were unsuitable burners.

The MAYOR: I am going to put before you an idea which I have been rash enough to have. If the Gas Committee had taken the bull by the horns, and for the first six months after the reduction of the candle power had undertaken to deal with the consumers' fittings, and after that left them to the trade generally, we should have had many fewer complaints.

Witness: We should have had no complaints at all—or very few.

The MAYOR said he had received a communication from a member of the public, who suggested that one of the reasons for the complaints as to defective supply was the corrosion which so quickly took place in the ¾-inch pipes from the mains to the meters.

Witness replied that out of the 12,000 complaints received during the last twelve months, 4092 were due to defects in service-pipes. These pipes were made of wrought iron, which was more susceptible to corrosion than the cast-iron main-pipes. Corrosion was inseparable from all gas supply. With regard to shutting down on Sunday during the summer months, he had instructions from the Chairman to do so before it had been brought before the Committee. The Committee afterwards confirmed the Chairman's action. The shutting down was done in direct opposition to his (witness's) advice.

The MAYOR: Whatever result came from this policy is not Mr. Brown's fault.

Witness then explained his views on reduced candle power. He said the reduction not only benefited the Gas Companies, but the consumers, in London, where the power had been reduced practically 5 candles below that of Nottingham. Candle power was only of importance to that small proportion—20 or 25 per cent.—of the consumers who continued to use flat-flame burners; and for these, the remainder of the consumers must suffer, both in the price of gas and in efficiency. The majority of the flat-flame burners in use gave only about 40 per cent. of the illuminating power of the gas; and he thought if more suitable burners were employed, the candle power might safely be further reduced.

Mr. *W. Garton*, the Gas Accountant, was called with reference to Mr. Brown's suggestion that all complaints should be forwarded direct to him (Mr. Brown). Witness said he had acted in the capacity of Accountant for the past 24 years. During that period, the method of receiving and attending to complaints had remained the same; and he thought it undesirable to alter it. If the complaints did not go to him in the first instance, the figures might be suppressed, and they would be a financial failure. It was possible to check the complaints if they were handed in to him and then passed on to the Engineer's office.

Mr. ELBORNE maintained that it would be better for complaints to be entrusted to men with technical knowledge, rather than to clerks.

Witness replied that he had always found the latter fully capable of dealing with the complaints.

The MAYOR: It looks to me like the case of a sick man going to the doctor's book-keeper, instead of to the doctor, to tell him what his complaint is.

Witness: I hardly think so.

Henry Whetton, a foreman at the Eastcroft works, was the first witness on Thursday. He said that his superiors were Mr. Brown, the Superintendent, and another foreman named Worthy; but Worthy and himself were in charge on days and nights alternately. He took his orders from the Superintendent. During a portion of 1905, there was some falsifying of records as to candle power on the jet photometer; but the same thing did not apply to the bar photometer. Whatever the readings of the jet photometer were, they were booked at a certain point. This was done with the full knowledge of the Superintendent, who set the jet, and who could see that the readings were booked higher than was justified. Several times the Superintendent sent back the records for alteration before he forwarded them to George Street, when they were not what he wanted. So far as witness knew, Mr. Brown was always aware of the instructions given to him; but he had no proof that this was so. Mr. Brown never saw a false record made, so far as he knew. Witness also spoke of the lowering of the seals during certain hours of the night. This was done by the "whistle blower," who received his instructions from the foreman on duty. The foreman was told never to let the light get below a certain point on the jet photometer—about 10 candles. When what they were doing was discovered, witness saw Mr. Brown and Mr. Harlow about it. He had worked there about eighteen years; and nothing of the kind had been going on under any other Superintendent.

Samuel Worthy said he had been foreman at the Eastcroft works for four years. He was cognizant of the falsifying of the figures; and instructions for doing this were given to him by the Superintendent by word of mouth. The instructions were not to book the jet below 15 candles; and this practice continued until the matter was discovered. He had no fact or evidence to show that anyone other than the Superintendent knew of this. The orders given in the daytime were given to the men on day duty; but as far as he knew, the seals were not lowered during the daytime.

Henry Hide, engine-driver at Eastcroft, said that weights were put on sometimes by the foreman; and when a certain period had elapsed, they were taken off again. The Superintendent was about the place when this was done; but so far as witness was aware nobody besides the engine-driver knew what was going on at night, because the Superintendent came down once and said: "What are you on with? I cannot see in the house." The practice of putting on weights was going on for two years previous to 1905. He thought that the more the people agitated, the worse the gas became. The practice was adopted soon after the new Superintendent came; and sometimes he (witness) thought the gas could not have been above 1-candle power.

Joseph A. Simpson, who became an engine-driver at Eastcroft four years ago, said that during the latter part of 1905 instructions were given to weight the engines to keep them in their proper travelling. Weights were put on sometimes by the Superintendent—this being during both the day and the night shifts.

Mr. *Brown* explained that there was nothing unusual about the weights.

F. B. Hutchinson, another engine-driver, also spoke to instructions being given to keep the candle power up to a certain standard. In the daytime the standard was 15 candles, and at night a little less.

Mr. *Garton* was then called again, and presented his report on the subject of complaints. Questioned with regard to an allowance for incorrect registering on an account with the Railway and General Engineering Company, who at their new premises had had since 1901 a 1000-light main meter and several smaller ones, witness said that the Corporation charges for gas were made out from the 1000-light meter. The Gas Committee had received complaints that the meter had been registering for four or five quarters a larger amount of gas than had been consumed; and the department had a complaint of overcharge from the Company in the summer quarter of 1905, when they deducted £16 from the account as a protest that the charge was excessive. This sum was, however, afterwards paid. When the bill for the September quarter was due, there was another complaint; but by this time the meters were being tested. The test of the meters showed that the main meter was 2·68 per cent. fast, and a 30-light sub-meter was 8·45 per cent. fast. That was to say, the meters were registering against the consumer; and in consequence there would be an overcharge. The Engineer afterwards communicated with him, saying he could not settle the matter with the Company; and it was left in the hands of the Chairman of the Gas Committee. Personally, he made no calculation of the amount of the overcharge, because the Chairman was dealing with the matter. Later, he saw Mr. Harlow, at the latter's request; and the Chairman told him that he had settled the question for a £35 allowance. The basis for this calculation, he presumed, was an allowance of 2 68 per cent. on the gas consumed since the meters were put down in 1901. The amount paid by the Company during that time was £1395. Making the 2·68 per cent. allowance for the whole time, the overcharge would be £37; and he thought that the allowance of £35 was a wise and not an excessive one. There had been complaints during the whole of the time the meters had been installed, though it was not until the June quarter of 1905 that the Company had stopped anything in payment of the account. They had previously had similar applications for an abatement from other customers. In cases where the meters were found to be wrong, it was usual for a consideration to be made for two quarters. There was, however, no rule.

The MAYOR: Why did not you have the matter brought before the Committee, and have a minute on the books? That is where all the trouble has been, I think.

Witness: I did not recognize it as my duty to bring such a matter before the Committee; but I should do so now. The Committee first heard of what the Chairman had done from the report of Mr. Mark Mellers, one of the Elective Auditors. Questioned by Mr. Harlow (who was present at the inquiry), witness said an allowance of more than two quarters had been made in the case of Messrs. Taylor Bros., of Sandiacre.

Mr. *Brown*, on being interrogated as to the matter, said the custom of the department was to allow a percentage off the quarter in dispute. The department took every reasonable precaution; but it was impossible to tell exactly when a fault occurred. There was no case on record where more than two quarters had been allowed on the certificate of a test. The first complaint he had from the Railway and

General Engineering Company was on July 1, 1905, though others might have been made without his knowledge through the Accountant's office. On Dec. 15, a leakage was discovered in one of the meters (a 200-light one); but this was entirely due to faulty work by the Company's own men. Immediately the two main meters were tested, he wrote to Mr. Crosta, as representing the Company, asking for a copy of the certificate, which he duly received, along with a statement showing Mr. Crosta's estimate of the gas over-registered by the two meters, which was worked out to show an equivalent of £48 2s. 11d. Witness thought the amount was excessive. In his opinion, £4 or £5 would have been an ample allowance for the two quarters—the current quarter and the one in dispute. The matter was discussed, but no agreement was come to; and Mr. Crosta asked him if he were willing to leave the question in the hands of the Gas Committee. The next occasion witness heard that the bill had not been paid was from Mr. Garton; and witness informed the latter that the matter had been left in the hands of the Chairman. At a later date Mr. Harlow came to him, and witness said that, in his opinion, the request for an allowance of £48 was an excessive one. Mr. Harlow said he would deal with the matter with Mr. Garton, and took the papers away with him. Eventually he learned that a sum of £35 had been fixed upon. Asked whether he had ever before seen certain documents produced by Mr. Harlow, witness said he had no recollection of having done so. He also said he did not think that certain pencil figures on them were those of any member of his staff.

Mr. *Edward Harlow*, who next gave evidence, said that unfortunately he was Chairman of the Gas Committee during the period they had just been dealing with—1905. He was Auditor to the Railway and General Engineering Company; and he had 50 £1 shares in the undertaking, the capital of which was £80,000. Witness produced papers (which he said were for some time lost), which gave the basis of the Company's claim against the Gas Department. The original claim was £70; but it included loss of time, foreman's wages, and so on. The actual figure for excess registration was £48 odd. Mr. Brown gave him the document containing the claim, and intimated that the dispute was acute between himself and Mr. Crosta. He asked witness if he would endeavour to bring about a settlement. He gave witness the idea that the claim was substantially correct; and the reason he was able to say that was because of pencil figures on the paper. Those figures were the figures of a clerk in the Gas Office; and they substantially agreed with the amount of the claim.

EDINBURGH AND LEITH GAS COMMISSIONERS.

Annual Meeting—Annual Dinner.

The Annual Statutory Meeting of the Edinburgh and Leith Gas Commissioners was held on Monday of last week—Lord Provost Gibson presiding. The business was altogether formal, and the meeting lasted only about a minute and a half.

On the evening of Wednesday, the Commissioners held their annual dinner, at which the Lord Provost again presided. Beside him were four ex-Lord Provosts of the City of Edinburgh—Sir Jas. Russell, Sir Andrew M'Donald, Sir M. Mitchell Thomson, and Sir Robert Cranston—all of whom were Chairmen of the Gas Commission when they were in office. The gathering was this year in the Royal Hotel. There was a company of about 100 present.

Lord Provost Gibson said he would not read the letters of apology for absence; but he would like to refer to the absence of their Engineer—Mr. W. R. Herring. They regretted the cause of his absence, which was ill health. He had left that day for the South of England, and they hoped his sojourn there would restore him to good health.

Mr. R. Millar, the General Manager of the Caledonian Railway Company, proposed the toast of "The Gas Commissioners." He said his first connection with gas-works was about fifty years ago, when his grandmother used to send him—a very little boy then—to Stirling to collect the dividend upon a few shares which her father had held in the Stirling Gas Company. He remembered that in those days the most approved method of discovering a leak of gas was by turning a newspaper into a sort of torch, about a yard long, and going with it lighted to the meter. His grandmother did that. He remembered that for the next fortnight she lay in bed, with her countenance adorned with cotton wadding and olive oil; and she gave him a bit of advice he never forgot—never to look for an escape of gas with a lighted newspaper, but to be content with a lucifer match. In later days gas makers had had to compete with various competitors. At one time it was thought that water gas was to be a formidable rival of coal gas; but water gas, he thought, must have been drowned in its own element. Then there was acetylene gas. Perhaps the most formidable rival coal gas had ever had was electricity; and for a time he thought that the period of coal gas was gone. But he was re-assured, on reading a few years ago a speech by the then Assistant Gas Manager in Glasgow, in which he said that the more electricity was used, the more coal gas was used. There was one thing which was greatly to be admired in the Gas Commissioners of Edinburgh and Leith; that was the amount of faith in gas they had displayed, and the courage they had shown, founded on that faith. That they believed in the permanence of the article they produced was shown, he thought, by the construction of the magnificent gas-works at Granton, which were the marvel, he might say, of Scotland.

Judge Bryson, the Convener of the Works Committee, acknowledged the toast, and said he could assure them that, notwithstanding the competition with electricity, the increase in the consumption of gas had been this year very marked. Gas, as they knew, was now burned in a very different manner from what it used to be. The spread of incandescent lighting had given a great impetus to the gas industry. At the last collection of their gas accounts they had a census taken of the persons who were burning gas in incandescent burners; and they found that, particularly in the working-class districts, over 70 per cent. did so. Gas-fires and gas-cookers had also helped to swell the gas consumption. As they knew, the Commissioners opened a new section of the works at Granton in October last; and he was pleased to say that they had given them every satisfaction. They were now in a position to meet any increase in the consumption of gas which might occur within the next ten years. They had begun to dismantle the plant at the New Street works; and the site of the works would soon be in the market for sale. Craigleith Quarry, which they purchased some time ago for a water supply, was giving them a sufficient supply of water for all purposes; and the water in the quarry had not diminished but increased. The state of their whole undertaking was due, he was bound to say, to the very able manner in which it was managed by their Chief Engineer, Mr. Herring. He was sorry that he was not with them that night, owing to his health having been a little run down; but he hoped he would soon recover, and be able to resume the good service he had given them.

Mr. R. Menzies, the Convener of the Finance and Law Committee, also acknowledged. They had, he was glad to say, very little law business. The financing, so far as the Convener was concerned, was an easy and a pleasant matter. This was owing to the very excellent Treasurer they had. Mr. Gibb was a careful financier, who never brought up work in a half-finished state. They handled a very considerable sum of money in the twelve months. Their rental, for the year to May 15 last, amounted to £307,275, and their expenditure to £216,000; leaving a balance of £90,000. They paid all their indebtedness, with £800 over. He called that good finance. They had sinking and reserve funds amounting to £183,000. Their credit was good, and they could always get money on reasonable terms.

Provost Mackie, of Leith, proposed the health of Mr. A. Wilson, the Gas Engineer of Glasgow. They were always pleased to have him with them, particularly when they remembered that, but for one vote, he might have been their Engineer.

Mr. Wilson regretted that his Convener—Mr. Calderwood—was not able, on account of indisposition, to be present. They were all very anxious to keep up the good relations which subsisted between Edinburgh and Glasgow. He regretted very much that Mr. Herring was indisposed, and he must take steps to express his sympathy with him. In the gas profession they recognized the great work that Mr. Herring had done for Edinburgh. Provost Mackie had said that he lost the appointment by one vote. He thought it a very good matter that that vote happened as it did, because it brought in another system of working in gas-works in Scotland, which they would not otherwise have had. It gave them competition in working which they could not have had if they had stuck to the horizontal retort system. Mr. Herring had made the inclined retort system a success, from which they were all in Edinburgh reaping a benefit; and they in Glasgow were also reaping a benefit, because it had spurred them on to greater exertions, to see that they could do as well with the horizontal system as could be done with the inclined. It was to the advantage of all consumers of gas that they should have this competition. He was very glad that in Glasgow he had had the opportunity to carry on things in the way that he thought best, and that Mr. Herring had had the opportunity in Edinburgh to carry on things in the way that he thought best. In the gas profession they recognized that the competition with electricity was a great benefit to them. In Glasgow this year they were going to have the biggest increase they had ever had, which meant that there was plenty of room for both systems of lighting. They were going to have an increase over last year in Glasgow of as much gas as would supply a town of the size of (say) Kilmarnock twice over. He begged to propose the health of the Lord Provost of Edinburgh, to whom, and to the Gas Commission of Edinburgh and Leith, of which he was Chairman, they wished all success.

The toast was acknowledged by the Lord Provost in a few words, and the proceedings were brought to a close by the singing of "Auld Lang Syne."

STREET LIGHTING BY GAS IN EAST LONDON.

At the Meeting of the Poplar Borough Council last Thursday, the Electricity Committee reported that an agreement had been submitted to them embodying the terms upon which the Commercial Gas Company would supply gas to public lamps. The inclusive rates of charge were as follows: No. 4 Kern burners, 70 to 100 candle power, £3 9s. per annum for the first eighteen months, and £2 18s. per annum thereafter; No. 3 Kern burners, 50 to 75 candle power, £3 9s. per annum for the first fifteen months, and £2 9s. per annum thereafter. The agreement was to be terminable by three months' notice after the expiration of the respective periods named in regard to the first installation of incandescent gas-lamps. The Committee recommended that the agreement should be sealed; and this was agreed to. On the same day, the Works Committee of the Bethnal Green Borough Council reported having had under consideration the question of improving the lighting of the main roads. For the past four months they have had on trial three types of double burners in some of the existing lamps in Bethnal Green Road and Hackney Road; and they gave in detail the results of the experiments and the inquiries made in connection therewith. In Bethnal Green Road, the lamps are fitted with double Sugg burners, which consume 5 cubic feet of gas per burner per hour, and cost for gas, lighting, extinguishing, and mantles, £5 12s. 4d. per lamp per annum. The lamps fitted with similar burners consuming 4¼ cubic feet of gas per burner per hour, cost for maintenance £4 19s. 7d. per annum. Other lamps fitted with "C" burners consuming 3¾ cubic feet of gas per hour, cost for maintenance £4 17s. 4d. per annum, or £5 2s. 1d. if bye-passes are used. In Hackney Road, the various classes of lamps are in exactly the same order as in Bethnal Green Road. The Committee stated that if the Council decided to adopt double burners for lighting Bethnal Green Road, Green Street, Roman Road, Cambridge Road, and Hackney Road, except those portions which are partly lighted by Bethnal Green and partly by the neighbouring borough, the additional cost of the 5-feet burners over the existing lamps would be £380; if the 4¼-feet burners were used, it would be £292; and if "C" burners without bye-passes were used, it would be £276, or with bye-passes £309. The Committee were of

opinion that the best results were given by the 4½-feet burners. The cost of supplying the lanterns, fitted complete with double 4½-feet burners, would amount to about £2 18s. per annum. They proposed to erect these lamps in the roads specified; and in order to further improve and equalize the lighting, they suggested that nine additional lamps should be erected in the main roads—making a total of 138 lamps. The estimated cost of this work amounted approximately to £415 for the purchase of lanterns, &c., and the annual cost of maintenance, gas, &c., to about £691, or £292 in addition to the present annual cost. The Committee added that the cost of lighting per mile in Bethnal Green was £120 per annum; while the average in the 28 Metropolitan Boroughs was £178. The cost per mile in the neighbouring boroughs for the year 1903-4 (the last for which figures were available) was: Hackney, £157; Poplar, £222; Stepney, £233; and Shoreditch, £335. The Committee's suggestions were agreed to.

A RECORD YEAR FOR GAS AT TORQUAY.

In spite of competition, the prosperity of the Torquay Gas Company continues to grow in a very satisfactory manner. The report presented to the annual meeting last Wednesday announced that the increase in the sale of gas last year amounted to more than 8½ million cubic feet; and is a record in the history of the Company. A reduction in the price of gas last Lady Day from 2s. 11d. to 2s. 10d. per 1000 cubic feet no doubt had the effect of stimulating consumption; and this in turn reacted on the revenue. The receipts from the sale of gas increased by £533, and there was also a larger revenue from meters, prepayment fittings, and cooking-stoves on hire. Mr. W. B. Beynon (the Deputy-Chairman), who presided, congratulated the shareholders on these features of the report, and said the financial statement was distinctly encouraging for the future. The fact that the increase in the sale of gas constituted a record, could not be overlooked when they took into consideration the powerful opposition of the electric light supplied by the Corporation. The days of gas were clearly not yet numbered. The total revenue was £35,565, and the expenditure £27,915; leaving a balance of £7650. The receipts from residuals had increased by £996, and the revenue from this source was one of the main causes of the low price of gas. It was decided to pay the ordinary dividends of 10 and 7 per cent. on the two classes of shares. A letter was read from the Chairman of the Company (Mr. J. Kitson), who was unable to attend, calling attention to the advance in the price of coal, and pointing out that in view of this no further reduction in the price of gas could be thought of for the present. In the course of the discussion, reference was made by a shareholder to the question of forming a superannuation fund for the employees. The Chairman explained that the Directors found a difficulty in creating such a fund, because most of the workpeople and clerks subscribed to other funds, and were not prepared to pay to an additional one. No deserving old servant retired through ill-health or accident without receiving consideration from the Company. A recommendation was made by shareholders that the Directors should consider the question of a gratuity to the employees. Mr. R. Beynon (the Manager), Mr. R. P. Kitson (the Secretary), and Mr. J. Duckworth (the Accountant) replied to a vote of thanks passed to the officers of the Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas Commissioners of Edinburgh and Leith held on Monday last what is known as their statutory meeting, the business at which was exceedingly meagre, consisting only of the statement by Judge Bryson, the Convener of the Works Committee, that the Committee had that day fixed the price of gas for public lighting at 2s. 5d. per 1000 cubic feet for flat-flame burners, and 2s. for incandescent lighting—both figures being the same as last year. A more important gathering took place on Wednesday evening, when the Commissioners entertained themselves and a number of friends at dinner in the Royal Hotel. This was not a statutory meeting; but it was taken advantage of by speakers to make public a few facts regarding the gas undertaking—facts which are well known to those who interest themselves in such matters, but which the general public are in danger of forgetting unless they are occasionally reminded of them.* The evening was spent very pleasantly; the only subject of regret being the absence of Mr. W. R. Herring, the Engineer, who has fallen into ill-health, and had that day gone South to recuperate. As there will be numerous inquiries into the nature of his ailment, it may be as well to state that he is suffering from a carbuncle low down in the back of the neck, and to point out that the fact that he has been allowed to travel is an indication that his medical advisers are satisfied that he is on the way to recovery. There is but one wish regarding him in the district he serves, and that is that he may soon return to his duties, restored in health and re-invigorated in body by his holiday.

The Scottish Juniors from the Western District spent three very pleasant, and it is to be hoped profitable, hours in the oil-works of Messrs. James Ross and Co., at Philpstoun, three miles to the east of Linlithgow, this afternoon. Though it was oil and not gas works that were being visited, it was easy to be gathered that there was something to be seen which would be of value to gas makers. The presence of Mr. A. Wilson, of Glasgow, was sufficient to bear out this view. The chief point of interest was, of course, the vertical retorts. The inspection of these occupied most of the time. To anyone with even the slightest knowledge of carbonizing processes, the sight of the retort-bench at work must have been a great treat. The extreme simplicity of the arrangements and the quietness of the working must have struck many as being remarkable. But to those who have a more specialized knowledge, the explanations, which were very freely and fully given, of the principles underlying the working, could not have failed to bring home ideas that may be looked for to bear fruit. There was quite an education in itself in seeing the progressive nature of the carbonizing process as practised in the three distinct sections of the plant, each having been designed with a view to accomplishing something which experience had shown was not as yet being got, but which might be. About 800 tons of shale are put through in 24 hours. But for the activity displayed in the coal-breaking department, an outsider would not imagine that half of this quantity was being dealt with, so quiet and easy is the work. The Juniors may well be grateful to Messrs. Ross for giving them so excellent a lesson in carbonizing. An interesting

* A report of the proceedings will be found on p. 835.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 797.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 14	7	Bombay, Ltd.	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅝	..	5 1 10
50,000	10	Feb. 28	14	Bourne- 10 p.c. P	27½—28½	+½	4 18 3
51,810	10	,,	7	mouth Gas B 7 p.c.	16¾—17	..	4 2 4
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	9½	Do. New	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	117—122	..	4 2 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	101—104	..	3 16 11
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220—225*	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk.	160—165*	..	5 0 0
460,000	20	Sept. 27	10	British	42½—43½	+½	4 11 11
104,000	Stk.	Feb. 28	6	Bromley, Ord. 5 p.c.	119—122	+½	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	90—93	+½	4 16 9
500,000	10	Oct. 12	7	Buenos Ayres (New) Ltd.	11½—12	..	5 16 8
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	93—95	—1	4 4 3
150,000	20	Mch. 14	8½	Cagliari, Ltd.	23—25*	..	6 12 0
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
100,000	10	Oct. 26	4½	Do. 4½ p.c Pref.	8½—9½	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	+1	5 13 2
50,000	Stk.	Dec. 28	4½	Do. 4½ p.c. Deb. Stk.	96—98	..	4 11 10
157,150	Stk.	Feb. 28	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,443,280	Stk.	,,	5⅛	Commercial 4 p.c Stk.	107—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	105—108	..	4 12 7
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	83—85	..	3 10 7
800,000	Stk.	,,	6½	Continental Union, Ltd.	120—123	—1	5 5 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	..	4 17 11
462,170	Stk.	Aug.	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	Jan.	4	Do. Deb. Stk.	103—105	..	3 16 2
486,090	10	Jan. 31	11	European, Ltd.	24—25	..	4 8 11
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Feb. 14	4⅛	Gas- 4 p.c. Ord.	95—97	..	4 10 10
2,600,000	,,	,,	3½	light 3½ p.c. max.	87—89	..	3 18 8
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	106—108	..	3 14 1
4,193,975	,,	Dec. 13	3	Coke 3 p.c. Con. Deb.	83—85	..	3 10 7
258,740	Stk.	Mch. 14	5	Hastings & St. L. 3½ p.c.	95—100*	..	5 0 0
82,500	,,	,,	6½	Do. do. 5 p.c.	116—119*	..	5 9 3
70,000	10	Oct. 12	11	Hongkong & China, Ltd.	19¼—20½	..	5 7 4
4,940,000	Stk.	Nov. 14	8	Imperial Continental	176—179	—2	4 9 5
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	93—95	..	3 13 8
184,602	Stk.	Mch. 14	6	Lea Bridge Ord. 5 p.c.	117—122*	..	4 18 4
306,083	,,	Dec. 28	4	L'rpool Unit'd Deb. Stk.	110—112	..	3 11 5
561,000	Stk.	Feb. 28	10	Liverpool United A.	223—225	..	4 8 11
718,100	,,	,,	7	Do. B.	164—165	..	4 4 10
144,140	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	Nov. 29	5	Malta & Medn., Ltd.	4¼—4½	..	5 5 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 14	3½	Monte Video, Ltd.	11½—12½	..	5 12 0
1,775,892	Stk.	Feb. 28	4⅝	Newc'tle & G'tesh'd Con.	106—103	..	4 5 8
406,025	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	96—97	..	3 12 2
15,000	10	Feb. 28	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 29	8	Oriental, Ltd.	150—155	..	5 3 3
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6¼	..	5 7 8
398,490	5	Oct. 26	7	Primitiva Ord.	7⅞—8	—¼	4 7 6
796,980	5	Jan. 31	5	Do. 5 p.c. Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
851,070	10	Oct. 12	7	River Plate Ord.	12¼—12¾	..	5 7 8
300,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Mch. 14	10	Sheffield A	244—246*	+1	4 1 4
209,984	,,	,,	10	Do. B	244—246*	+1	4 1 4
523,500	,,	,,	10	Do. C	244—246*	+1	4 1 4
70,000	10	Oct. 26	10	South African	15½—16½	..	6 1 3
6,350,000	Stk.	Feb. 14	5½	South Met., 4 p.c. Ord.	120—123	..	4 9 5
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	84—85	..	3 9 9
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	154—156*	..	5 2 7
605,000	Stk.	Feb. 28	5½	S'th Suburb'n Ord. 5 p.c.	120—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
117,058	,,	Jan. 16	5	Do. 5 p.c. Deb. Stk.	125—130	..	3 16 11
502,310	Stk.	Nov. 14	5	Southampton Ord.	107—112	..	4 9 3
120,000	Stk.	Feb. 28	6½	Tottenham A 5 p.c.	123—126	..	5 3 2
398,940	,,	,,	5	and B 3½ p.c.	101—103	..	4 17 1
137,500	,,	Dec. 28	4	Edmonton 4 p.c. Deb.	101—103	..	3 17 8
182,380	10	,,	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	102—104	..	4 16 2
193,742	Stk.	Feb. 28	5	Tynemouth 5 p.c. max.	104—106	..	4 14 4
30,000	Stk.	Feb. 14	8	Wands- A 5 p.c.	—	..	—
255,636	,,	,,	6½	worth B 3½ p.c.	135—140	..	4 12 10
75,000	,,	,,	5⅝	and C 3½ p.c.	111—113	..	4 19 1
79,416	,,	Dec. 28	3	Putney 3 p.c. Deb. Stk	79—82	..	3 13 2
845,872	,,	Feb. 28	5⅛	West Ham 5 p.c. Ord.	101—104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	..	4 1 4
228,300	,,	Dec. 28	4	Do. 4 p.c. Deb. Stk.	102—105	..	3 16 2

Prices marked * are "Ex div."

statement was made by Mr. J. W. Muir, the Works Manager, with reference to the shale-field. This extends northwards from the works; but after going a certain distance it was found that the shale became of a twisted and charred nature, and inferior in quality. This was owing to the fact that an eminence about a mile to the north is of volcanic origin, and the shale is understood to have been destroyed by the heat from the one time burning mountain. The firm, on discovering this, turned their workings eastwards, where they are finding shale in purity and abundance.

Mr. A. Wilson, the Gas Engineer to the Corporation of Glasgow, last night delivered the last of the series of popular lectures promoted by the Corporation on the work of the different departments. The lecture was given in the Berkeley Hall, and was well attended—Mr. Kirkpatrick presiding. Mr. Wilson informs me that there was nothing new in his lecture, and that he was, in fact, called in as a stop-gap; so that it is not necessary to say more than that Mr. Wilson's remarks and illustrations showing how to burn gas seemed to be regarded with much interest, as, there can be no doubt, he was able to give his hearers information which was altogether new to many of them.

In the Falkirk Town Council on Monday, the Gas Committee reported that the Manager had received estimates for the hooping of the chimney, which was showing signs of cracking, and that the tenders had been placed in the hands of the Convener and Manager, with powers. It was mentioned that a report upon the condition of the gas-works had been obtained from Mr. H. Rule, the Assistant-Manager, who acted as interim Manager; and that it was thought to be right, because it was desirable that they should know the condition of the works before the new Manager entered upon his duties. The proceedings of the Committee were approved of.

An inquiry was held in Glasgow on Wednesday, under the Private Legislation Procedure (Scotland) Act, 1899, into an application by the Caledonian Railway Company for a Provisional Order, in which they ask powers for various purposes. The only opposition to the measure was offered by the Dundee Town Council, who, as Gas Commissioners, had petitioned against the provisions relating to the carriage of coke from the gas-works to the harbour of Dundee. The Harbour Trustees had agreed with the promoters that, until after the expiration of seven years from November last, and the railway between Dundee and Arbroath had been widened by its increase to four lines of rails, the quantity of coke to be carried from the gas-works to the coal-hoist at the harbour should not exceed 100 tons per month, or 1000 tons per annum. The Commissioners asked that the minimum should be 250 tons per week, and that facilities should also be granted for the carriage of coal from the harbour to the gas-works. For the promoters, it was argued that to take coal and coke across the main railway line, at a point where there was a large quantity of traffic, would be dangerous; and that the remedy of the Town Council was to be obtained from the Railway and Canal Commissioners, if they thought that reasonable facilities were being denied them. For the Corporation, it was argued that the want of facilities for the carriage of coal and coke between the harbour and the gas-works put them to the disadvantage of having to pay more money to the Railway Companies (it is a joint line), which meant that the community must be charged an increased rate for gas. If it were difficult to take the material across the two main lines of railway, it would be infinitely more so to do it if there were four lines to cross. Mr. A. Yuill, the Gas Engineer to the Corporation, stated in evidence that the material carried by the Railway Companies last year into the gas-works was 74,410 tons, and out of the works 34,467 tons. The output of coke from the works was about 40,000 tons per annum, about half of which was sold in Dundee, and the other half either for shipment or sending inland. The total quantity sent out for shipment during the year to the 28th of February last was 8330 tons, made up as follows: 3926 tons to Methil, 3638 tons to Burntisland, 346 tons to Bo'ness, and 420 tons to Tayport. The railway dues paid for the conveyance of coke amounted to £1032. In consequence of the stand taken by the Railway Companies, they had been unable to get any coke shipped from Dundee, or to get any coal brought in by sea, except when, by an act of benevolence, the Companies allowed them to get a few waggons of coal from a ship's side into the works. The offer to accept 100 tons would be of no advantage to them; they would not be able to arrange for any ship to take so small a quantity. If they carted coal from the harbour, it would have to be put into waggons at the works, so that it might be carried to the high level. This view did not take into account the fact that they could get coal brought to Dundee cheaper by sea than by land. It cost 2s. 6d. per ton to carry coke from the gas-works to Fife ports, whereas 1s. per ton would be sufficient were the coke shipped from Dundee direct, which represented a saving of about £600 a year to the Commissioners. As late as the 14th inst., they had a good offer for 10,000 tons of coal, to be shipped for them at Grangemouth or Bo'ness; but they could not accept it, owing to being unable to convey it from the Dundee docks. Other evidence was to the effect that to carry 250 tons per week would require no more than four trains. The Parliamentary Commissioners who held the inquiry found the preamble of the Order proved, and repelled the objection of the Corporation. The decision is a disappointing one. What action they may now take has not yet been considered.

Notice was given in the Kilmarnock Town Council on Wednesday, by Mr. Turnbull, of a motion to the effect that a Special Committee should be appointed to consider and report on the present working of the Gas Department, as well as of the Electric Lighting and Tramways Department, with the view of ascertaining whether or not any schemes can be evolved with reference to either or all of them, whereby greater economy or efficiency can be obtained; the report to contain full particulars regarding the oncost of the working of each, and make special reference to the number of officials earning more than 30s. per week, with their salaries and duties, and be in the hands of the members of the Council not later than Saturday, the 8th of June next. A much smaller range of inquiry has occupied Special Committees for a far longer time than Mr. Turnbull seems willing to allow; but as his object may almost be read to be a day's shooting among officials earning more than 30s. per week, perhaps the inquiry may, if it should come to be made, be very much narrower than is threatened.

A substantial proof of continued confidence.

IN OPEN COMPETITION.

Messrs. JOHN WRIGHT & CO. have just secured the renewal, for **ANOTHER** period of **THREE YEARS,** of the "Slot" **COOKER BUSINESS** of

The United Liverpool Gaslight Company.

CURRENT SALES OF GAS PRODUCTS.

Week ending March 23.

There is little change in the London market for tar products. Ninety per cent. benzol is if anything a little firmer; and it is not thought that less than 11d. per gallon net would now be accepted. Toluol, both 90 per cent. and pure, is in very good demand. Considerable sales of 60° crude carbolic have been made at 1s. 8½d. Crystals continue at about 5⅝d. net for 35°. There is more inquiry for ordinary London creosote than can really be satisfied; and it is not expected that 2½d. net at makers' works would now be accepted. Inquiries for pitch, both for prompt and to the end of this year and well into next year, are increasing; and makers' ideas continue to be very firm—27s. to 28s. net at makers' works is a fair quotation for next season. Sulphate of ammonia continues quiet; but the price is maintained at about £12 per ton on Beckton terms.

LIVERPOOL, *March* 23.

Sulphate of Ammonia.

There has again been a quiet market, available parcels being more plentiful, while fresh orders have been rather scarce. The large makes are being delivered and shipped against contracts made in advance. So far Home demand has only been on a moderate scale. Consequently the closing quotations are £11 15s. per ton f.o.b. Hull, £11 17s. 6d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. Neither has there been any activity for delivery ahead, buyers not being seriously in the field. For April-June and April-September delivery, £12 per ton is quoted; but although £12 is reported to have been paid, business has been done at something less.

Nitrate of Soda.

This article is firm both on spot and for spring arrival; and spot prices remain 11s. 6d. and 12s. per cwt. for 95 per cent. and refined quality respectively.

LONDON, *March* 23.

Tar Products.

Markets have been very quiet during the past week. In pitch, there again appears to be some disposition on the part of manufacturers to sell for delivery this side of June. In London, business has been done at 25s. 6d. for prompt; while on the east coast 25s. has been accepted. At ordinary ports on the west coast 24s. has been taken, and 24s. 6d. in Liverpool. There is little demand on the Continent, where buyers are only interested in forward delivery, and that at very low prices. Benzol, 90 per cent., is very quiet. Business has been done freely on the east coast at 10d.; and it is reported that in one instance 9¾d. was accepted. Although steady, 50-90 per cent. is quiet, and makers would accept 11d. on the east coast. Toluol is very firm and scarce; but there is no alteration in price. Solvent naphtha is slightly steadier; and it is reported that 1s. 2d. has been realized at a favourable port on the east coast. The second-hand parcels of creosote which have lately depressed the London market have now been cleared away; and as the London makers are well sold and quite content to wait, the market is very firm indeed, and high prices are asked. In the North, business is again reported at 2d.; but most of the manufacturers are asking 2¼d. In the Midlands, oil is exceedingly scarce, and from 2⅜d. to 2½d. per gallon is being paid. In carbolic acid, Continental consumers have now reduced their price to 1s. 8d. per gallon on the east coast, and consequently English buyers have also reduced their limits. Crystals are unchanged, with orders very scarce indeed; and manufacturers would certainly accept something under the market prices for a good contract. There is no alteration in the position of anthracene.

The average values during the week were: Tar, 14s. to 18s. Pitch, London, 25s. 6d. to 26s.; east coast, 25s.; west coast, 24s. to 24s. 6d. Benzol, 90 per cent., 10d. to 10½d.; 50-90 per cent., 11d. to 11½d. Toluol, 1s. 2d. to 1s. 2½d. Crude naphtha, 4⅜d. to 5d.; solvent naphtha, 1s. 1½d. to 1s. 3d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2¼d. North, 2d. to 2⅛d. Heavy oils, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8½d. Naphthalene, £5 to £9; salts, 37s. 6d. to 42s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market is very quiet indeed, and prices appear to be declining. In London, the principal Companies now ask £12 1s. 3d.; but ordinary makes could be secured at considerably under this figure. In Leith, £12 is again reported to have been paid; but doubtless the very small quantity offering is the explanation of such a good figure having been realized. In Liverpool, £11 16s. 3d. has been accepted for second-hand lots; but, on the other hand, makers report having refused offers of £11 17s. 6d. In Hull, small quantities have been sold at prices varying between £11 15s. and £11 17s. 6d.

Gas Exhibition in Kilmarnock.—Last week an exhibition of the gas appliances of Messrs. R. & A. Main, Limited, and of Messrs. Falk, Stadelmann, and Co., Limited, was held in the Oddfellows' Hall, Kilmarnock, under the auspices of the Corporation of that town. At the opening ceremony, Provost Hood pointed out the advantages, in the matter of cleanliness, convenience, and economy, which were to be gained by using gas appliances. Mr. A. P. Main spoke of the rapid development that had taken place in the use of gas-stoves, and said it was always a pleasure to come to Kilmarnock, for in Mr. Fairweather the Corporation had one of the most enterprising gas engineers in the country, and one who gave every facility to the public to acquire stoves for all kinds of work. Miss E. M. Dods lectured twice daily.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The request for steam coal continues in such considerable volume from many quarters that the commodity is kept scarce; and while that condition is maintained, there is no likelihood of prices falling. Although it is true that house coal has decreased in demand, it is still large enough to compel some coalowners to draw supplies from stocks. There are no reductions in rates. Steam coal and cannel, as pointed out last week, are considerably dearer. Users, however, come to the terms as they find them. Contracts are readily entered into. The shipping trade in coal remains steady. Some curiosity has been aroused by the puffing of some new invention in the treatment of coal which is said to be about to be established in Trafford Park, and which, according to Sir Wm. Bailey, is shortly to astonish mankind; but the stolidity of John Bull has not been much moved by the announcement. He will require actual proof of the efficacy of the invention before giving any credit to the at present hidden marvel. Last week's quotations, as averages, remain unchanged; but while there is little coal of any description to be had at less than our quotations, the better qualities in many of the Lancashire pits are realizing higher figures. The past year has been exceptionally prosperous in the coal trade. The total output was 236,111,150 tons, or an increase of 15,000,000 tons compared with 1905. Coal exported to foreign countries last year was 57,792,000 tons, to which must be added 17,396,000 tons of bunker coal, making the gross exports 76,382,000 tons. From the Great Central Railway Company's docks at Grimsby, the exports in 1874 were 366,000 tons; in 1885 there were 409,000 tons; in 1895 the total was 1,124,000 tons; in 1905 the total rose to 2,161,000 tons; and in 1906 to 2,522,000 tons.

Northern Coal Trade.

There is a better request for coals; but it has been interfered with by the stormy weather, which delayed the arrivals of collier-steamers. The pits have, on the whole, worked well; and there is a demand now that is made heavier by the usual needs before the holiday. In the steam coal trade, best Northumbrian steams are about 15s. per ton f.o.b., second-class steams are 13s. to 13s. 6d., and steam smalls are firm at 8s. 6d.—the approach of the Baltic season rather stimulating the market. In the gas coal trade the question of the renewal of the long southern contracts has come to the front. The general inquiry for Durham gas coals shows some falling off, as is usual near the end of March; but the deliveries are well taken up. The price that is current is from 11s. 10d. to 12s. 9d. per ton, according to quality, f.o.b.; while an occasional sale at slightly less may have been made, where a colliery was feeling the effect of the delay of steamers. As to the contracts, the news of the placing of large quantities in Yorkshire does not seem to have much influenced prices here. Coke is steadier, with a better demand for furnace kinds. Gas coke is firm—the price for good gas coke varying from about 13s. 6d. to 14s. 6d. per ton f.o.b.

Scotch Coal Trade.

There is no change in the market; but there is a change in the situation, in respect that on Friday last the Scottish Coal Trade Conciliation Board agreed to advance the miners' wages by 6¼ per cent.—equal to 3d. per day. This is already the third increase of a similar amount this year; and there are now indications that a rise in the wages of the oncost men is to be asked. These constant advances in wages do not give much promise of an early reduction in the price of coal. Meantime, there is a great demand for all sorts of coal; and prices are not quotably higher. These are given at: Ell 12s. to 13s. 6d. per ton f.o.b. Glasgow; splint 13s. to 13s. 3d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 249,987 tons—a decrease of 14,016 tons upon the preceding week, but an increase of 29,257 tons upon the same week of last year. For the year to date, the total shipments have been 2,601,504 tons—an increase of 165,164 tons upon the corresponding period of 1906.

Yorkshire Gas Coals for London.

Under the above heading, the "Newcastle Journal" last Tuesday made the following remarks: "We understand that the negotiations which have been in progress on the part of the large London Gas Companies with the Yorkshire collieries have now resulted in very considerable purchases, amounting in all, it is said, to about 1,000,000 tons out of a total 3,500,000 or more required. This 1,000,000 tons is said to be apportioned to the two chief London Companies in the proportion of 600,000 and 400,000 tons each; while the prices range round about 10s. 9d. to 10s. 10½d. a ton f.o.b. Humber—that portion bought c.i.f. being reported at 13s. 9d. to 14s. a ton, with a freight calculated to be about 3s. 1½d. a ton. So far neither of the Companies indicated appears to have bought anything in this district; but it is currently reported to-day that the tenders sent in to the Commercial Gas Company on the basis of current prices have been rejected as out of the question, while the collieries in reply have simply declined further negotiations, and something like a deadlock between buyers and sellers has arisen in consequence.

Embezzlement by a Meter Inspector.—A fine of 20s. and costs was the light punishment imposed (consequent on the prosecutors declaring that they had no desire to press the case), at the Keighley West Riding Police Court, upon Harry Firth, late a gas-meter inspector in the employ of the Haworth Urban District Council, whose money he was charged with embezzling. Only two sums, amounting to about a sovereign in all, were mentioned in the charge. Evidence was given by a man who used to go round and take the meter-indices with defendant, that the latter called out the readings while the witness entered them up; and the allegation was that in one of the two cases defendant had so manipulated his index-book as to make the amount of gas consumed correspond with the money he had handed over to the collector. In the second case, however, there was no entry whatever for gas for the half year for which he had received payment.

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Sales of Shares and Stock.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards placed two new issues of capital by order of Directors, and conducted a successful sale of shares and stock. The first new issue consisted of some £10 "G" ordinary and preference shares in the Aldershot Gas and Water Company. The former rank for a maximum dividend of 7 per cent., and are entitled to a dividend at this rate; and they were all sold at from £14 to £14 2s. 6d. per share. The preference shares were 5 per cent., and they fetched from £11 12s. 6d. to £12 each. The other new issue was £3000 of additional ordinary stock and £2500 of 5 per cent. preference stock of the Southgate and District Gas Company. The ordinary stock was sold at from £140 to £141 per £100 of stock, *cum div.* at the rate of 7 per cent. per annum as from the 1st prox. The preference stock realized prices ranging from £110 to £114 per £100. Some original ordinary consolidated stock of the Brighton and Hove General Gas Company, ranking for a standard dividend of 10 per cent., subject to the sliding-scale, and carrying 11½ per cent., was sold at from £220 to £222 10s. per £100; and some "A" ordinary consolidated (7 per cent.) at from £160 to £162 per £100, *cum div.* at the rate of 8¼ per cent. per annum. A parcel of fully-paid £10 "B" shares in the Tendring Hundred Water Company (last dividend 4½ per cent. per annum) was disposed of at from par to 5s. prem. It may be remembered that tenders were recently invited in our advertisement columns for an issue of £15,851 of consolidated stock of the Newport (Mon.) Gas Company, bearing a maximum dividend of 5 per cent. per annum. They were opened on Friday, when it was found that the applications were for much more than the amount at disposal. The issue was allotted at prices ranging from £114 down to £111 per £100 of stock; but a proportion of the tenders at the lower price had to be declined.

Belfast and the Lighting of Whiteabbey.

In the "JOURNAL" last December (p. 771), reference was made to a proposal of the Belfast Rural District Council to secure the powers of an Urban Sanitary Authority, under the Public Health (Ireland) Act, 1878, for the purpose of the public lighting of Whiteabbey and part of Jordanstown. An inquiry was held by the Local Government Board; and as the result of the report of the Inspector (Dr. C. J. Clibborn), they have written informing the Belfast Rural Council that, in their opinion, the necessity for the lighting has been generally established, and the opposition which was offered at the inquiry was mainly confined to the question of the extent of the area of charge. The Board, however, do not consider it necessary to deal with this point at the present stage, in view of an objection raised by Mr. D. M. Wilson on behalf of Major-General M'Calmont. The effect of Mr. Wilson's contention was that the grant of urban powers would not enable the Rural District Council to do what they proposed—namely, to purchase the gas at a fixed rate from the Belfast Corporation, and convey it to the lighting area at Whiteabbey—inasmuch as the power of contracting for a supply of gas conferred on an urban authority by section 80 of the Public Health (Ireland) Act, 1878, is limited to contracts with a company or person supplying gas within the district, whereas the Belfast Corporation do not appear to supply gas in any portion of the rural district. The Board are advised that this objection is well founded; and, accordingly, before taking any further action in the matter, they desire to give the rural district an opportunity of reconsidering their position. They add that the powers given under the second section of clause 80, if conferred on the Council, would enable them to undertake to supply gas themselves; but they would probably find it desirable to obtain a Provisional Order for the purpose, so that they might be possessed of the powers given by the general statutes for gas-works. It has been decided to hold a special meeting of the Rural District Council to consider the letter.

Reinstating Trenches in Westminster.

In a report circulated last Tuesday, the Works Committee of the Westminster City Council stated that they had had under consideration a letter from the Gaslight and Coke Company with reference to the Council's charges for reinstating trenches in macadam roads. In the opinion of the Company, the Council's specification for such work is too onerous to allow of a reasonable quotation being forthcoming. The Company referred particularly to the use of a steam-roller on all trenches and the minimum charge at the rate of 2 yards, and went on to suggest that the use of the roller should be limited to openings for mains only of a minimum superficial area of 23 feet, and that the minimum charge should be fixed at 1 yard instead of 2 yards. From inquiries made by the Committee in other Metropolitan Boroughs, it seemed that in seven of them the steam-roller is used on all trenches without distinction, in fourteen it is used on large trenches only, not including services, and in two it is not used at all. The average price per square yard charged by 22 of the Boroughs is 2s. 2½d., while the Westminster Council's present charges are 3s. 6d. per square yard under 5 yards, and 3s. per square yard over 5 yards. Where a minimum charge is fixed in other boroughs, it is at the rate of 1 yard. In Westminster the Council's minimum is 2 yards. On receipt of these replies, the Committee adjourned the consideration of the Company's letter, in order to enable the City Engineer (Mr. J. W. Bradley, M.Inst.C.E.) to amend the specification attached to the Council's tender form for reinstating macadam roads after trenches had been made. The City Engineer has now submitted his revised specification, which retains the condition that all trenches shall be steam-rolled, but the price to be inserted in the schedule is to be for "repairs to trenches at per yard super., whatever the length or area of the trench may be," instead of prices for more than 5 yards, for less than 5 yards, and for a minimum charge included in the existing contract. The Committee have directed that tenders should be invited for repairs to trenches in macadam carriageways to the revised specification and schedule submitted by the City Engineer; and the Gaslight and Coke Company are to be informed of the action taken.

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Reduction in Price at Exmouth.—The Directors of the Exmouth Gas Company have made a reduction of 1d. per 1000 cubic feet in the price of gas; bringing it down to 3s. 5d. A discount of 5 per cent. being allowed, the net price is 3s. 3d.

Cost of Street Lighting in Southwark.—At the meeting of the Southwark Borough Council last Wednesday, the Works Committee submitted the following return (prepared by the Borough Engineer) of the cost of street lighting in various parts of the district: High-pressure gas in Borough High Street, £1129 6s. 8d. per mile; electric arc lamps in Walworth Road, £865 6s. 8d.; incandescent gas in the Borough High Street, £308; do. in Old Kent Road, £242; electric Nernst lamps in Falmouth Road, £242; do. in Gurney Street, £130 3s. 4d.; incandescent gas in Swan Street, £168 13s. 4d.; Searles Road, £154; Heygate Street, £113 13s. 4d.; Pollock Road, £95 6s. 8d.

A Gas and Electric Competition at Wolverhampton.—Considerable anxiety was lately displayed by both the Wolverhampton Corporation Electricity Department and the Wolverhampton Gas Company to secure an extensive lighting contract at the Sunbeam Motor Works at Blakenhall; and in order that a decision might be arrived at regarding the claims of the rival illuminants on the score of economy, a lighting competition was held in the show-room at the works. Two 500-candle power electric arc lamps and two 300-candle power incandescent gas-lamps were left burning for 60 hours. The cost, it is said, worked out at 14s. 9d. for the electric light, against 4s. for gas. It will be seen therefore that, even after making allowance for the difference in the nominal candle power of the lamps, the result was enormously in favour of gas. The contract has been given to the Gas Company.

Gas Supply at Blackwater.—At the recent annual meeting of the Blackwater Gas Company, the Directors reported a balance of profit which would allow of the payment of the maximum dividends at the rate of 10 and 7 per cent. The Chairman (Mr. A. H. Claypole, J.P.), in moving the adoption of the report, said the make of gas last year had been 50 million cubic feet, or at the rate of 10,500 cubic feet per ton of coal used. All the items on the receipts side of the revenue account showed increases, while, with the exception of coal, those on the expenditure side exhibited decreases; and on the total amount there was, notwithstanding a 10 per cent. augmented make of gas, a reduction of 6 per cent. in the working expenses. He gave the following figures to show the growth of the Company: In 1900 the make of gas was 16,666,800 cubic feet; in 1901, 18,674,300 cubic feet; in 1902, 21,120,700 cubic feet; in 1903, 32,304,000 cubic feet; in 1904, 42,523,200 cubic feet; in 1905, 45,428,500 cubic feet; and last year 50,566,400 cubic feet. He said these figures needed no comment; and he would only add that this year, up to the present, there had been an increase of 1,373,600 cubic feet in the make, compared with last year. Mr. A. Kitt remarked that the growth of the Company's business had been unprecedented. The report was adopted, and the dividends recommended were declared. A vote of thanks accorded to the officers was acknowledged by the Secretary (Mr. S. Rowe) and the Engineer (Mr. J. Meiklejohn).

Price of Gas at Wrexham.—In last week's "Journal" (p. 767), when referring to the report of the Directors of the Wrexham Gas Company, it was stated that they "proposed" to reduce the price of gas by 3d. per 1000 cubic feet, to take effect in the September quarter, which would make the net charge 2s. 3d. for lighting, and 2s. for cooking. This was, however, a mistake, as the reference in the report was to a reduction of 3d. which was made last September, by which the net prices became as follows: For lighting, 2s. 6d.; for cooking, 2s. 3d.; and for engines, 2s. per 1000 cubic feet.

Proposed Retort-House Machinery for Skipton.—When submitting to the Skipton Urban District Council a scheme for the introduction of stoking machinery to the gas-works, Mr. W. Graham, the Chairman of the Gas Committee, said he regretted that the inevitable result would be to displace labour; but he pointed out that, on humanitarian grounds alone, the change was justifiable, inasmuch as human stoking was a burden which should not be imposed upon any man. The estimated cost of the change was £2535; and the saving effected in working would be at the least £500 a year. There was a long discussion, during which opposition was raised, on the grounds that the time was inopportune, having regard to several public schemes now being carried out, and that the change would involve serious structural outlay at the works. It was eventually decided to postpone coming to a decision on the matter.

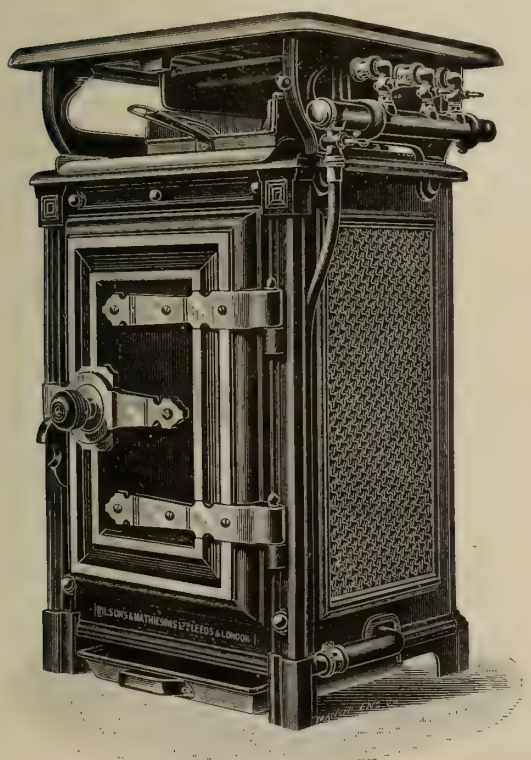
Wakefield Water Supply.—In his report for the past year, the Wakefield Water Engineer, Mr. C. Clemesha Smith, says that the daily average consumption of water in the city and out-districts was 2,599,000 gallons, an increase of 28,700 gallons over that of the previous year. Meter supplies increased by 110,900 gallons daily; but the domestic supply (all unmetered) decreased by 82,200 gallons per day. The number of persons supplied outside the city is approximately 100,000. The out-districts consumed 460,746,000 gallons, showing a net increase on the previous year of 14,822,000 gallons. The city's consumption was: By meter, 185,454,000 gallons, or an increase of 24,084,000 gallons; otherwise than by meter, 262,268,000 gallons, or a decrease of 29,961,000 gallons. The total consumption was 948,648,000 gallons, showing a net increase on the year of 10,499,000 gallons. The Deacon meter system continued to work to advantage.

Messrs. Joseph Taylor and Co., of Bolton, have received from Messrs. Kempson and Co., Limited, of Pye Bridge, an order for one of their latest type of solid plate-lead saturators, for a make of 25 tons per week. The last one has been at work for over sixteen years.

The Conway Rural District Council have written stating that, should the Llandudno Urban District Council proceed to obtain powers for supplying the village of Penrhynside with gas, the Rural Council would offer no objection to such procedure. The Llandudno Gas Committee recommend that the Clerk should take steps to secure the necessary powers.

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Messrs. W. Speaight and Sons, of Fetter Lane, E.C., have published (price 1d.) "A Simple Explanation of the Workmen's Compensation Act, 1906," for the use of employer and employee.

The Pinner Gas Company, in answer to their recently advertised invitation for tenders for 400 (B) shares of £5 each, received tenders for over 600 shares. The average price at which the shares were allotted was a fraction under £7 9s. per share.

We have received from the Carron Company their new abridged catalogue of general castings, which has just been issued. They occupy about 60 quarto pages, and yet they are stated to be only a small selection from the Company's immense range of manufactures. The Company have special facilities for the production of iron goods, as they mine their own ore, smelt it with coal from their own collieries, and carry out all subsequent operations at their works at Carron, in Stirlingshire; and the catalogue under notice will give an idea of the varied character of the articles turned out.

Messrs. J. & H. Robus, the well-known Engineering Contractors, announce the removal of their London Offices from Bucklersbury to Nos. 2 and 3, Norfolk Street, Strand, W.C.

We have received from Messrs. Peckett and Sons, of the Atlas Works, Bristol, a very artistically got-up booklet containing views of their shops and some of the locomotives built therein. The productions of the firm are exclusively confined to locomotives for branch lines, for shunting and hauling operations at gas and other works, as well as for contractors' purposes; and a special feature is that all parts are made to standard gauges and templates, so that every locomotive is interchangeable with others of the same size and class. The views of the works, which cover five acres, occupy 42 oblong pages; and they are followed by about a score of examples of locomotives. The illustrations, which are preceded by some introductory remarks, are very clearly printed, and are enclosed in a stiff embossed wrapper bearing an effective design.

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GAS AND WATER ENGINEER. Ramsgate Corporation. Applications by April 15.
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In consequence of the EASTER HOLIDAY, all Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

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